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&
LIGNARIA
HUNGARICA

AN INTERNATIONAL JOURNAL
IN FOREST, WOOD
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Power of Forest Stakeholders in the Participatory Decision Making Process: A Case Study in Northern Italy

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Abstract – In European countries, current forest use aims to enhance goods and services supplied by forest ecosystems, taking into account the multiple needs and interests of society through a participatory process. A successful participatory process requires a thorough analysis of stakeholders' perceptions and preferences. The aim of this paper is to investigate the differences between stakeholders' perceived influence and real power in forest management. A questionnaire survey was carried out among 51 forest stakeholders in a case study in the Italian Alps. Perceived influence was measured by asking stakeholders to rate on a 5-point scale the extent to which they can influence forest management issues. Real power was analyzed using social network analysis (SNA), investigating the relationships that stakeholders have with each other in the network. Real power was measured using a Freeman's degree centrality measure, which focuses on the direct ties coming in and out for each stakeholder. The results show that public administration is the category of stakeholders with the most power in all forest management issues, while the actors of the tourism sector are in a marginal position. In addition, the results of the study suggest that in many cases stakeholders have a distorted perception of their own power.

multi-objective forest management / influence / public participation / stakeholder analysis / social network analysis / Valle di Non (Italy).

Kivonat – Az erdőkhöz kapcsolódó érdekcsoportok érdekérvényesítő ereje részvételen alapuló döntéshozatali folyamatokban – Észak-olaszországi esettanulmány. Az európai országokban a jelenlegi erdőhasználat az erdei ökoszisztémákból származó termékek és szolgáltatások erősítését célozza meg megfelelően a részvételen alapuló folyamatokban megnyilvánuló sokrétű szükségleteknek és érdekeknek. A részvételen alapuló folyamatok sikere meg kívánja az érdekeltek szemléletének és preferenciáinak részletekbe menő vizsgálatát. Jelen írás célja annak vizsgálata, hogy az érdekeltek észlelt és valós, erdőgazdálkodásra gyakorolt érdekérvényesítő képessége között milyen eltérések találhatók. Az olasz Alpokban 51 erdővel kapcsolatos érdekelt bevonásával kérdőíves felmérés készült. Az észlelt érdekérvényesítő képességet azon keresztül mérték, hogy az érdekeltektől azt kérték, hogy 5 fokozatú skálán jellemezzék, milyen mértékben képesek befolyásolni az erdőgazdálkodással kapcsolatos kérdésköröket. A valós érdekérvényesítő képességet a társadalmi kapcsolati háló elemzés módszerével vizsgálták, feltárva az érdekeltek egymás közötti kapcsolatait. A valós érdekérvényesítő

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képesség mérése a Freeman fokszám központiséggel történik, amely az egyes érdekelttek egymás közötti kapcsolatait veszi alapul. Az eredmények azt mutatják, hogy a közigazgatás csoportjába sorolható érdekelttek minden erdőgazdálkodást érintő kérdésben a legbefolyásosabbak, míg a turizmus szereplői a legkevésbé erősek. Továbbá a vizsgálat eredményei arra engednek következtetni, hogy sok esetben az érdekelttek torz képpel rendelkeznek a saját érdekérvényesítő képességükkel kapcsolatban.

többcélú erdőgazdálkodás / befolyás/ nyilvános részvételi folyamat / érdekelt elemzés / kapcsolati háló elemzés / Valle di Non (Italy)

1 INTRODUCTION

The participatory approach in the development of multi-objective forest management strategies has responded to the need to include multiple stakeholders and interests in the decision making process (Martins – Borges 2007, Pukkala 2002). This approach recognized that forest management should combine and synthesize multiple management objectives into a coherent set of practices (Appelstrand 2002). Moreover a participatory approach – involving local community in the decision-making process – is a way to increase social sustainability and an important tool to support sustainable forest management (Kangas et al. 2006, De Meo et al. 2011).

In the light of these considerations, it is evident that participatory forest management is a complex issue, where several stakeholders - who often have different interests and expectations (e.g. wood production, recreational activities, nature conservation) - are involved (Webler et al. 2001, Mendoza – Martins 2006). When both the number of stakeholders and the stakes are high, the participatory process is strongly influenced by the relationships, the coalitions of interests, and the balance of power among the participants. In this context, the analysis of stakeholders' power is relevant, in order to understand their role and the influence of individual stakeholders or coalitions in the decision process, and to guarantee transparency and fairness of the process itself (Paletto et al. 2012, Paletto et al. 2015). In particular, the analysis of power distribution among stakeholders is important in cases when the decision making process is influenced by a few powerful stakeholders, while a large number of stakeholders remain passive and without a real power.

The historical origins of the concept of power must be sought in *Leviathan* (1651) by Thomas Hobbes. The analysis made by Hobbes distinguishes the power of a person in i) natural power, which includes the abilities of the body and mind as intellect and strength, and ii) instrumental power, which derives from the acquired faculties and advantages of friends, money or reputation. *Leviathan* (1651) was the starting point for the development of subsequent theories of power such as those developed by Max Weber (1947) and Robert Dahl (1961). In current political science, power can be defined as “the probability that an actor within a social relationship will be in a position to carry out his own will despite resistance” (Weber 1947). Starting from this definition, power can be considered as the ability of an individual in a relationship to exert influence on another person, in order to obtain the expected outcomes (Simpson et al. 2014). In other words, the exercise of power implies that a stakeholder has power to the extent that he can use coercive, utilitarian or normative powers to impose its will in the relationship (Etzioni 1964). The possible strategies in order to influence a person can be direct or indirect: the first type is visible and unambiguous, while the second is less visible and more subtle. Weber's power definition was analyzed and re-elaborated by Dahl (1961) in his theory of community power. The fundamental principle of the theory is that society is pluralistic, where community interests are represented by means of open processes. In this pluralistic society, power is exercised by a specific actor, while other actors are prevented from doing what they would like to do. If power can be defined as the

potential to influence and as a basic force in social relationships (Keltner et al. 2003), then influence can be considered the exercise of power (Turner 2005). Social actors have a clear objective intent to influence the behavior of someone else to achieve their goals.

From a sociological perspective the concepts of power and influence have clear definitions, but in everyday reality they are closely inter-related. The interactions between individuals or groups are shaped by patterns of power and influence (Lasswell – Kaplan 1950). Power can be wielded through resources such as threats to use instruments for the purpose of causing damage, the control of tools that restrict the action of others, and all other elements that can hinder or be a detriment to others. The most common resources that power utilizes are strength, knowledge, prosperity, capital (material, immaterial and social), and organization. It is important not to confuse power with its resources, because resources alone do not necessarily translate into power.

Concerning influence, a person has influence on another when they are able to alter the other person's behavior through the application of pressure. It is a sort of mediate power that is able to modify the behavior of other actors without the need for orders or threats. On the other hand, this influence is a kind of social relationship that modifies the original behavior of someone through means such as communication, charisma, or persuasion (Nye 2008).

Another main issue when dealing with participatory forest management is to distinguish the levels of power and influence between stakeholders. Inter alia, it is important to analyze perceived influence that is defined as “the believed ability to affect other actors' behaviors or beliefs by effectively controlling resources (e.g. information, ability to make decisions, etc.) skillfully and willfully” (Weible 2005).

Starting from these considerations, the present research considers the “perceived influence” as the stakeholders strive to influence the decision making process, and power as the real capacity of stakeholders to influence the decision making process, which can be measured by objective methods. The main aim of the research is to define a useful method for comparing stakeholders' perceived influence and real power. The proposed method was applied in a case study in North Italy (Valle di Non, Trentino-Alto Adige region), characterized by multiple stakeholders' interests and high relevance of forest resources both from the economic and social point of view. Power was quantified through the analysis of stakeholders' relationships and networks (social network analysis), while information on perceived influence was collected through a questionnaire survey of forest stakeholders. Finally, results of perceived influence and real power were compared in order to highlight behaviors of the different stakeholders' categories. This type of analysis is useful because it can support the decision makers during the participatory process in order to include all the interests at stake in the final plan.

2 MATERIALS AND METHODS

2.1 Study area

The study area is the Valle di Non (*Figure 1*), in Trentino-Alto Adige Region (North-East of Italy). Valle di Non is a rural valley (596.7 km²), with a well-developed agricultural industry (apple and grape production) and forestry sector. As an outcome of a territorial specialization process that occurred during the last thirty years, the Valle di Non is home to a relevant quota of apple production (5% of the European production). Urban centers of the Valle di Non, 38 small country communes, are surrounded by fields and farms lying between 400 and 1,200 m a.s.l. where the main product - apples - are cultivated. The labor force employed in the primary sector is around 20% of the total labor force of the valley. The forest area is around 350 km² (59% of total area) and the main forest types are Norway spruce (*Picea abies* (L.)

H. Karst.), Scots pine (*Pinus sylvestris* L.) and European larch (*Larix decidua* Mill.) dominant forests. Broadleaf forests, mainly European beech (*Fagus sylvatica* L.) forests, are concentrated in the low part of the valley. Considering the forest property, forest areas are mainly public and common forests (80%) managed by municipalities and self-organization of common forests called *Amministrazioni Separate per i beni di Uso Civico* (ASUC). Forest management is conducted according to Forest and Wildlife Service of Autonomous Province of Trento guidelines (Notaro et al. 2009). The remaining 20% of forests belong to small private owners (Grilli et al. 2014). The standing stock of the high forests in Valle di Non is about 4 million m³ with an annual increment of 64,000 m³ per year. The harvesting rate is approximately 55% of annual increment.

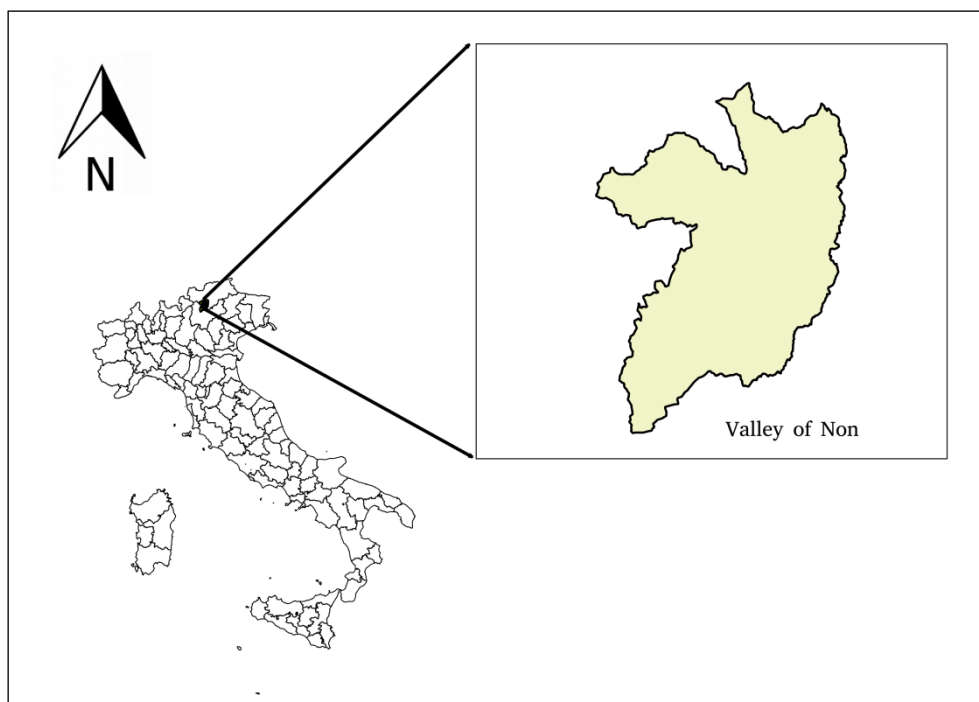


Figure 1. Location of the study area (Valle di Non) in Italy.

2.2 Three-stages methodology of research

The research framework was structured in three stages: (1) stakeholder analysis, (2) questionnaire survey, (3) statistical analysis and comparison of the data collected with the questionnaire.

The stakeholder analysis aims to identify, characterize, and classify the stakeholders in order to determine the extent of their future involvement in the decision making process (Grimble – Wellard 1997). All stakeholders - individuals, communities, social groups or institutions of any size, aggregation or level in society (Grimble – Chan 1995) - who affect and/or are affected by the policies, decisions, and actions of the system should be recognized.

In the present research, the stakeholder analysis was conducted through two steps. The first step was a brainstorming session between project researchers and local experts (forest managers and planners). A preliminary list of stakeholders was identified and then the sample was completed with a snowball sampling technique: names of other potential stakeholders are collected from the initial group. This sampling method is usually employed in the investigation of social networks and social dynamics (Noy 2008). At the end of the stakeholder analysis, 51 stakeholders were identified and classified in four main categories: 25 public administrations (municipalities, ASUC, Forest and Wildlife Service of Autonomous Province of Trento), 7 associations (alpine clubs, local hunting and environmental associations),

13 forest-wood chain actors (forest enterprises and sawmills), and 6 tourism sector actors (hotel keepers, agencies of tourism development).

During the second stage, a questionnaire survey was conducted among selected stakeholders through face-to-face interviews. The stakeholders, selected as representatives for each organization or association, were: mayors or council members of the municipalities, heads of the forest enterprises, sawmills and hotel operators, presidents of the associations and ASUC, and managers of the Forest and Wildlife Service of Autonomous Province of Trento. The questionnaire was aimed at assessing stakeholders' perceived influence and power in the participatory forest planning. The questionnaire included 17 closed-form questions and was subdivided in four thematic sections ("organization information", "personal information", "social and human capital", "forest management and local tradition"). Closed-form questions were used to analyze quantitatively the collected data. Moreover these questions are quick and easy to answer, and require little time investment. Being conscious of the limitations of closed questions, such as the impossibility of individual interpretation and in-depth response (May 1997, Paletto et al. 2013), time was left to the interviewees to discuss and express their opinions. A preliminary version of the questionnaire was prepared by the researchers previously involved in the stakeholder analysis and pre-tested with some local experts.

In the third stage of the research, the questions of the section "social and human capital" were processed and analyzed from the statistical point of view using XLStat 2012. Data analysis focused on the following aspects: (1) stakeholders' personal perception of their influence on the decision making process, (2) real power of stakeholders in terms of relational embeddedness, and (3) correlation between the two above mentioned aspects.

2.3 Perceived influence

The perceived influence of stakeholders on the forest management decision making process was assessed by the statements of the respondents. Stakeholders were asked to evaluate the influence of their organization in relation to six key-issues of forest planning and management. The key-issues were the following: (1) forest management for the production of timber, bio-energy and non-wood products (mushrooms and wild berries); (2) forest management for recreation, tourism and landscape purposes; (3) forest management for the protection against natural hazards (landslides, rockfalls, avalanches); (4) forest management to maintain and improve biodiversity and habitats; (5) environmental rehabilitation (quarries and landfills restoration), (6) management of wildlife (mainly ungulates such as red deer, roe deer and chamois). The six key-issues were chosen based on their importance in the multi-objective forest planning and the local guidelines of forest policy. The first issue focuses on the enhancement of the productive function of forests which includes both the wood production areas and the areas dedicated to non-wood products. The second issue includes the recreational areas, frequented by a large number of tourists, while the third considers the protective areas as defined by the third Ministerial Conference for the Protection of Forests in Europe (MCPFE). In the fourth issue protected areas, such as national and regional parks, nature reserves, and Natura 2000 sites are included. The fifth issue includes degraded areas such as quarries and landfills, while the last comprises the game reserves. Each of the six issues was scored using a 5-point Likert scale (from 0=no influence to 4=very high influence).

The data collected with the questionnaire were statistically processed and the main descriptive statistics (mean, median, standard deviation) were calculated. The aggregation of all key-issues was used as indicator for describing the perceived influence of the groups. In addition, the non-parametric statistical test of Kruskal-Wallis was applied in order to evidence differences between categories of stakeholders in relation to each single key-issue. The non-parametric statistical tests were chosen because the data distribution is not normal and the number of observations is low. All statistical tests were assessed at the $\alpha = 0.05$ level.

2.4 Power

The real power of stakeholders was assessed on the basis of the relational embeddedness, using the social network analysis (SNA) method. SNA is a formal theory to define and analyze the relationships that organizations or individuals (stakeholders in general) have with each other and it focuses on positions and structural patterns of actors (Wasserman – Faust 1994, Scott 2000). Analysis of social networks allows the opportunity to unpack the social factors and provides information about knowledge exchange. According to Weiss et al. (2012) and Mills et al. (2014) SNA can highlight which stakeholders are important for influencing policy or actions, or for facilitating information and knowledge transfer.

The main practical applications of SNA in the forest sector found in the international literature are summarized as follows: Tikkanen et al. (2003) studied the regional network of forest-related organizations in northern Finland, Harshaw and Tindall (2005) employed a social network approach to examine the role of social capital in the relationships between people and forested landscapes in Canada, Vennesland (2004) analyzed the importance of networks in forest-based rural economic development in Norway, while Paletto et al. (2012) applied SNA in a participatory landscape forest planning study in Italy.

In the present paper, SNA was applied to highlight power distribution among forest stakeholders. In particular, network centrality was used and quantified in order to analyze the role and position of stakeholders in the network. Network centrality considers sociocentric network data that provide information on relationships among all actors within a bounded social network (Freeman 1979, Marsden 2002). According to Freeman (1979), global centrality can be expressed through three types of centrality: degree centrality, closeness centrality, and betweenness centrality. In sociological terms, degree centrality represents the level of communication activity; betweenness centrality represents control of communication as the ability to restrict the communication of others, while closeness centrality represents independence (Mizruchi – Potts 1998). In addition, network centrality is a fundamental concept to account for actors' social status, power and satisfaction with group activities (Bavelas 1950, Leavitt 1951). Some research showed a positive relationship between centrality in the network and power (Brass 1984, Krackhardt 1990). Despite this, not all measures of centrality can be considered an appropriate indicator of an actor's real power (Mizruchi – Potts 1998). According to Freeman (1979), degree centrality was defined as the number of alters to whom an actor is directly tied and represents the ability to communicate directly with others (level of communication activity). Considering these theoretical assumptions, in this research the degree centrality was considered as a measure of the real power of individual stakeholders. Information useful to assess degree centrality was collected through the survey questionnaire. Specifically, two types of information were collected: (1) number and type of stakeholders with which the respondent has a professional relationship in the field of forest planning and management (six key-issues), (2) strength of relationships. It is important to emphasize that only collective stakeholders (institutions, organizations and associations) were considered in the analysis. The strength of relationships was evaluated distinguishing three types of ties according to strength: very weak, weak, strong. Strong ties are comprised of all of those types of relationships in which either the stakeholders are involved in an emotional manner, while weak ties are those relationships established by different stakeholders among which communication is sporadic and where emotional intensity is generally low (Granovetter 1973).

The graphic elaborations and the degree centrality values were realized with the software programs NetDraw and UCINET 6.0 (Borgatti et al. 2002).

The Freeman's formula used to calculate the degree centrality is the following:

$$Dc(n_i) = \sum_{k=1}^n a(n_i, n_k) (N - 1)^{-1}$$

Where:

D_c = degree centrality

a_{ik} = arc between nodes (1 when there is a connection between n_i and n_k , 0 when there is not a connection between n_i and n_k).

The degree centrality calculated for each stakeholder was aggregated in categories of stakeholders (public administrations, associations, forest-wood chain actors and tourist sector actors).

3 RESULTS AND DISCUSSION

3.1 Perceived influence

The aggregate result (all key-issues together) for individual stakeholders' perceived influence shows that values are included in a range between 0 and 23. The highest values were recorded for the following stakeholders: Brèz municipality (P_i total=23), Forest and Wildlife Service of Autonomous Province of Trento (P_i total=20), Dambel municipality (P_i total=19), and the sawmill of Sarnonico municipality (P_i total=18).

Statistical results (mean, median and standard deviation) of perceived influence per category of stakeholders are reported in *Table 1*. The mean value was used as a synthetic indicator of perceived influence by category of stakeholders.

Public administrations perceive their level of influence as medium on four issues (wood production, forest recreation, hydrogeological protection and biodiversity conservation) and low and very low for wildlife management (P_i mean=1.08) and environmental rehabilitation (P_i mean=1.56). The total level of perceived influence of the public administrations taking into account all key-issues is 9.72.

Representatives of the associations declared a high and very high level of influence on two forest management issues: biodiversity conservation (P_i mean=2.50) and forest recreation (P_i mean=2.00), while for the other issues the level of influence is quite low. The high level of influence on the biodiversity conservation issue is mainly affected by the answers of hunting association representatives. This is reasonable because they contribute to the wildlife population census and to the provincial hunting plan. The total level of perceived influence of this category is equal to 8.43.

Actors of the tourism sector declared a low or very low level of influence for all forest management issues; according to these declarations the total level of perceived influence of this category of stakeholders is 2.67. It is interesting to highlight that their perceived influence is low (P_i mean=0.67) also on the valorization of tourism and recreation in forests. This scarce perceived influence is not surprising, since the decision making process in Valle di Non is mainly driven by public actors. Otherwise, it is important to underline that such a low score may be interpreted also as a scarce interest of these actors in natural resources management. In such a case, this result could be more worrisome, because tourism in Valle di Non is mainly nature-based and the tourism actors are expected to be the main drivers of tourism and recreational activities in forest.

Finally, the forest-wood chain actors declared a low level of influence on three forest management issues (wood production, forest recreation and biodiversity conservation) and a very low level of influence on the other three issues (protection against hazards, environmental rehabilitation and wildlife management). The highest level of influence is on wood production (P_i mean=1.62).

Table 1. Mean, median and standard deviation of perceived influence on six key-issues of forest management per categories of stakeholders.

Category of stakeholders	Wood production	Recreation in forest	Protection against hazards	Biodiversity conservation	Environmental rehabilitation	Wildlife management
All stakeholders (n=51)						
Mean	1.51	1.51	1.19	1.65	1.16	0.86
Median	1	2	1	2	1	0
St.dev.	1.31	1.36	1.21	1.42	1.22	1.28
Public administrations (n=25)						
Mean	2.00	1.92	1.57	1.96	1.56	1.08
Median	2	2	2	2	1	0
St.dev.	1.10	1.32	1.27	1.30	1.26	1.47
Associations (n=7)						
Mean	0.67	2.00	1.50	2.50	1.29	1.43
Median	0	3	2	4	1	1
St.dev.	1.21	1.90	1.38	1.97	1.60	1.51
Tourism sector actors (n=6)						
Mean	0.17	0.67	0.33	0.67	0.67	0.20
Median	0	1	0	1	1	0
St.dev.	0.41	0.82	0.52	0.82	0.82	0.45
Forest-wood chain actors (n=13)						
Mean	1.62	0.92	0.77	1.15	0.54	0.38
Median	1	1	0	1	0	0
St.dev.	1.45	1.04	1.01	1.28	0.78	0.65

The non-parametric test of Kruskal-Wallis shows statically significant differences between categories only for the perceived influence related to wood production (K observed value = 13.415, K critical value = 7.815, p-value = 0.004). For this key-issue, the influence of public administrations and forest-wood chain actors is significantly higher than the other categories of stakeholders, while the non-parametric test of Kruskal-Wallis shows no significant statistical differences for the other five key issues.

3.2 Power

SNA results are reported in *Table 2* and *Figure 2*. As reported in *Table 2* (which shows the degree centrality values for all stakeholders in the network), Forest and Wildlife Service of the Autonomous Province of Trento are individual stakeholders with the highest values of degree centrality ($D_c=137$), followed by two municipalities (Malosco municipality $D_c=78$ and Brèz municipality $D_c=87$) and an ASUC ($D_c=63$). A high number of stakeholders have values of degree centrality that are rather low (D_c lower than 20). In light of these differences, we can assert that the forest sector network in Valle di Non is a highly centralized network, where one stakeholder (Forest and Wildlife Service) plays a key role, both in terms of power and prestige. This assertion is supported by the difference in values of degree centrality between Forest and Wildlife Service of the Autonomous Province of Trento and all other stakeholders. In addition, during the face-to-face interviews some stakeholders highlighted that the Autonomous Province of Trento is the key actor as regards all decisions on land planning and management in urban and rural areas. The centralized network presents the main advantage of rapidity and ease in decision-making, and the possibility for administrators to manage the forests of the valley with a unique and homogenous management approach. Conversely, this centralized network presents the main disadvantage in the risk of low participation in decision-making and of a de-empowerment of the other stakeholders in the area.

Besides, *Figure 2* shows that within stakeholders' categories there is a different distribution of power. In particular, it is important to highlight the marginal role of tourism sector actors: 3 hotel keepers have no ties with any other actor in the network and the other tourism sector actors are all in marginal positions, confirming the result derived from the perceived influence analysis. Instead, the forest-wood sector actors are in "key positions" in the network, in particular three sawmills (sawmill Sarnonico $D_c=54$, one of the two sawmills of Clès $D_c=36$, sawmill Drès $D_c=35$) and two forest enterprises (forest enterprise Darmine di Taio $D_c=38$, forest enterprise Livo $D_c=36$).

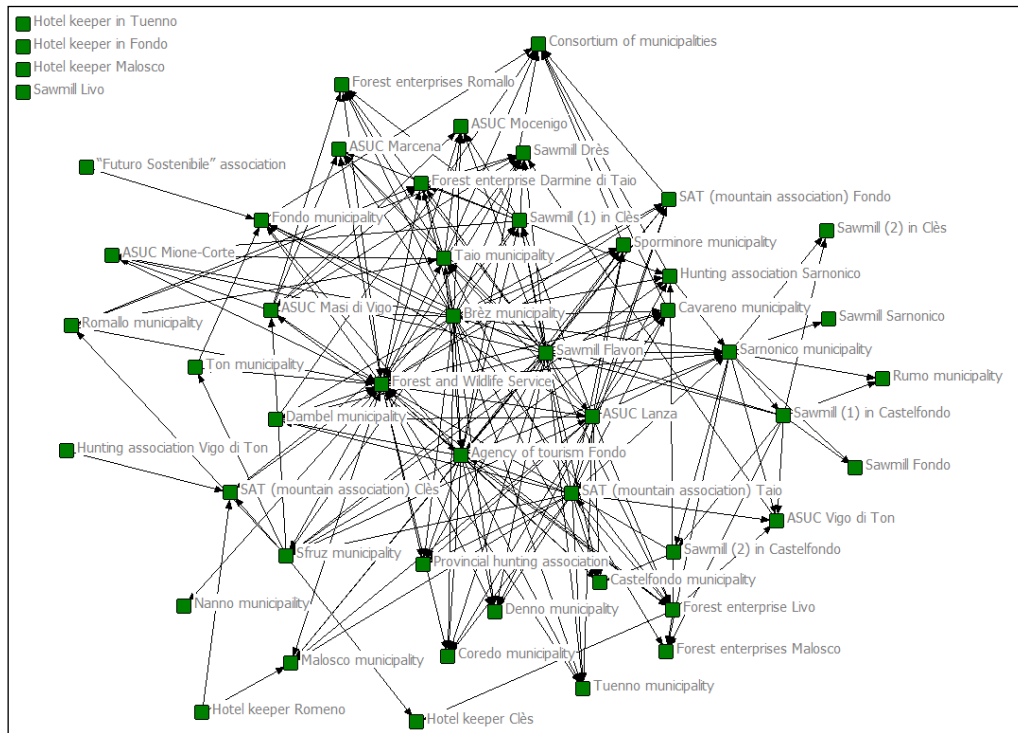


Figure 2. Social Network Analysis (SNA) of the forest sector stakeholders in Valle di Non.

To better understand real power distribution, it is important to make a distinction between indegree and outdegree centrality for the interpretation of the values in *Tables 2* and *Table 3*. The indegree centrality of a stakeholder depends on the number of incoming links, while the outdegree centrality sets the stakeholders in hierarchical centrality because it considers the outgoing links.

Table 3 shows the main statistics, considering the four categories of stakeholders.

Those actors who show elevated values of outdegree centrality occupy a central hierarchical position in the network, and are therefore able to directly reach a high number of actors. Nevertheless, this position does not ensure clear-cut prestige since the acknowledgment of the other actors (indegree centrality) is required.

Public administrations is the category with a greater concentration of power and this fact is mainly explained by the values of in-degree centrality, that for public administrations shows a mean value of 17.32, while for the forest-wood chain actors and the associations is equal to 7.08 and 8.29 respectively.

Conversely, the outdegree centrality values are higher for the latter two categories of stakeholders (forest-wood chain actors mean $OD_c=16.92$, associations mean $OD_c=18.86$) than for public administrations (mean $OD_c=10.44$). This result can be interpreted as a unidirectional flow of requests for technical advice or financial support from the various stakeholders towards public administrations.

Table 2. Indegree, outdegree and degree centrality values per each stakeholder

Stakeholder	Outdegree	Indegree	Degree
Hotel keeper in Tuenno	0	0	0
Hotel keeper in Fondo	0	0	0
Tuenno municipality	3	15	18
Taio municipality	15	18	33
Forest and Wildlife Service	78	59	137
Sawmill Fondo	0	6	6
Fondo municipality	3	20	23
Castelfondo municipality	2	18	20
Sawmill (1) in Castelfondo	26	3	29
Sawmill (2) in Castelfondo	6	6	12
Cavareno municipality	3	15	18
Consortium of municipalities	0	3	3
Sawmill Sarnonico	36	18	54
Sarnonico municipality	3	0	3
“Futuro Sostenibile” association	6	14	20
Hunting association Sarnonico	3	15	18
Denno municipality	0	12	12
Forest enterprises Malosco	3	15	18
Malosco municipality	72	6	78
Sawmill Flavon	3	6	9
Sawmill (1) in Clès	21	15	36
Rumo municipality	0	5	5
Sawmill (2) in Clès	0	6	6
Sawmill Drès	9	26	35
ASUC Vigo di Ton	3	12	15
Forest enterprise Darmin di Taio	18	20	38
ASUC Masi di Vigo	21	11	32
Hunting association Vigo di Ton	3	0	3
Hotel keeper Romeno	6	0	6
Hotel keeper Malosco	0	0	0
Sawmill Livo	0	0	0
Hotel keeper Clès	0	5	5
Provincial hunting association	0	15	15
Ton municipality	6	6	12
SAT (mountain association) Fondo	6	15	21
Romallo municipality	12	9	21
SAT (mountain association) Taio	23	6	29
Forest enterprise Livo	21	15	36
Brèz municipality	81	6	87
Forest enterprises Romallo	1	17	18
ASUC Marcena	1	17	18
ASUC Mocenigo	1	17	18
ASUC Mione-Corte	1	17	18
ASUC Lanza	54	9	63
SAT (mountain association) Clès	3	12	15
Agency of tourism Fondo	40	10	50
Sfruz municipality	18	15	33
Sporminore municipality	5	15	20
Dambel municipality	6	15	21
Coredò municipality	0	15	15
Nanno municipality	3	15	18

Table 3. Mean values of indegree and outdegree centrality per category of stakeholders

Category of stakeholder	Indegree	Outdegree
Public administrations (n=25)	17.32	10.44
Actors of forest-wood chain (n=13)	7.08	16.92
Associations/NGO (n=7)	8.29	18.86
Actors of tourism sector (n=6)	2.00	2.00

3.3 Correlation between perceived influence and power

The correlation between perceived influence and real power is analyzed to investigate if there is a correspondence or a deviation between these policy issues, and to understand reasons for different trends. The Spearman correlation between the perceived influence and the values of indegree, outdegree, and degree centrality are reported in Table 4. Results show a statistically significant correlation between the perceived influence and the values of indegree centrality ($r = 0.562$) and degree centrality ($r = 0.388$). For the fact that the degree centrality is the sum of indegree and outdegree, it is important to focus on the differences between these two indicators. The correlation between indegree centrality and perceived influence is relatively high because indegree can be considered a good indicator of the prestige and prominence of a stakeholder. A stakeholder is considered prestigious and prominent, if he is particularly visible to the other stakeholder in the network and the number of his ties in the network is high. Stakeholders in a prominent position in the network have a greater ease of influencing the choices of others stakeholders. This can be considered an indirect form of power.

Table 4. Spearman correlation between perceived influence and indegree centrality, outdegree centrality and degree centrality

Parameters	Indegree centrality vs. perceived influence	Outdegree centrality vs. perceived influence	Degree centrality vs. perceived influence
r	0.562	0.189	0.388
p-value	<0.0001	0.183	0.005
α	0.05	0.05	0.05

The Spearman correlation between the perceived influence and the indicators of real power shows that some stakeholders have a distorted perception of their own power. A limited number of stakeholders have a perceived influence higher than the real power, and in this group fall some hotel keepers and associations. Instead, the key actor of the network - the Forest and Wildlife Service of the Autonomous Province of Trento - declares a level of influence far below its real power. A similar situation is reported for some municipalities such as Malosco municipality ($P_i = 0$, $D_c = 78$), Brèz municipality ($P_i = 8$, $D_c = 87$) and an ASUC (ASUC Lanza $P_i = 8$, $D_c = 63$). The first interpretation for these differences is tied to a distorted perception of the reality: there are actors who overestimate their influence in the society they are living in and actors who, on the contrary, underestimate their power. Another interpretation for these differences could be of strategic nature: those actors who hold positions of power in the society say that they are not conscious of their role of prominence.

4 CONCLUSIONS

Over the last few decades, scientific literature concerning the techniques and methods for collection and analysis of social preferences in natural resources management has experienced a rapid growth (Trakolis 2001, Tarrant – Cordell 2002, Kumar – Kant 2007, Rodríguez-

Carreras et al. 2013, De Meo et al. 2013, Paletto et al. 2013). Despite this growth of interest, the analysis of the relationship between the power of social actors and decisions taken during the management process remains a little-studied field. The present work tries to contribute to the scientific debate in this field, focusing on the issue of relations between the real power of actors and their perceived influence.

In this framework, it is relevant to highlight that perceptions shape behaviors more than real power. In fact, if actors perceive a centralized structure of influence in the decision making process, most stakeholders would prefer to have relationships with the actor with more (perceived) influence. On the other hand, if there is a decentralized structure of (perceived) influence, actors recognize interdependence among stakeholders and would be more available to cooperate in a participatory process for obtaining their goals (Bobbio 2006, Elster 1998). Perceived influence could be more explicative than real power in understanding decision-making behaviors (Pruitt – Thomas 2007).

Results of the present research demonstrate that analysis of the differences between perceived influence and real power could give decision makers information useful for understanding the stakeholders' behavior, to search for opportune integrations between actors, and to choose suitable methods to give everyone due consideration.

Moreover, results show that single stakeholders and categories of stakeholders could have a rather distorted perception of influence on decisions, and a clear vision of power distribution is not foreseen.

This kind of information, combined with other qualitative and quantitative information provided by SNA, can improve the participatory process and reduce possible distortions of information among the decision makers. What is clear from the Valle di Non case study is the centralized structure of the decision making process. A few of the actors have a high level of power and a dual role in being an intermediary for particular interests and, concomitantly, remain the decisional center.

The authors want to evidence that in order to better manage a situation of conflicting interests and trade-offs between stakeholders' objectives, the network should be as inclusive as possible. In particular, in the Valle di Non case study, a deeper involvement of the tourism sector actors could play an important role in conservation strategies, since tourism is known to have an important role in this field (Bookbinder et al. 1998, Gössling 1999). On the other hand, greater power for the forest wood chain actors could create decisions towards a more intense timber harvesting scenario. In any case, an inclusive network society stimulates the debate around natural resources, allowing for increased awareness about other stakeholders' interests and facilitating shared decisions.

Concerning the adopted methodology, survey questionnaires and social network analysis have the advantage of being simple and require a limited number of data. Limits of the method could be related to the typical disadvantages of face-to-face interviews such as: a higher need for personnel involvement, the necessity of interviewer training, higher costs of data collection, some stakeholders' unavailability to be interviewed, and incomplete answers to some questions.

Finally, it is of course necessary to point out that relations between real power and perceived influence and, in general, studies concerning relations between social network and forest management, are influenced by a combination of factors and deeply rooted in the local context. For this reason, case-study surveys offer ideas and insights that could be used to improve this field of research.

In particular, future steps of this research must be focused on alternative measures of real power through other indicators and the comparison between these indicators and SNA data.

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Perceptions of Forest Owners and the General Public on the Role of Forests in Slovakia

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Abstract – During the past decades, the awareness of environmental issues in forest management is increasing due to changes in environmental education. The perceptions of forests, sustainable management, and ecosystem services were studied through two surveys. The general public and forest owners were the two target groups. The questionnaires had similar questions, though two different methodological approaches were used – the CATI system, for general public opinion survey, and semi-structured questionnaires for forest owners. The second survey contained more detailed questions regarding forest properties. Combined answers from 1503 respondents from the general public and 150 forest owners were evaluated on the following topics: sustainable forestry, major ecosystem services, and perceptions of forests. The majority of the Slovakian public regards ecological values as the most important element, whereas forest owners prefer the economic purposes for the maintenance and enhancement of forests. Forest owners tend to visit their forests once per week, whereas the general public tend to visit only once per month. The main cause for this non-attendance in the general public was a lack of recreational time, followed by a disinterest in forests. The main purpose for visiting forests for both groups was recreation. Overall, it can be concluded that people are mostly satisfied with forest management in Slovakia. Forest owners are satisfied with their forest properties, and plan to keep them for their children. In the future, more attention should be focused on investigating the younger generation's perception of forests.

environmental education / forest functions / ecosystem services / forest management

Kivonat – Az erdőtulajdonosok és a közvélemény felfogása az erdők szerepéről Szlovákiában.

Az elmúlt évtizedekben a környezet-tudatosság az erdőgazdálkodásban emelkedett, amelyben a környezeti nevelésnek is szerepe van. Az erdők, az erdőgazdálkodás és az ökoszisztéma szolgáltatásokkal kapcsolatos felfogást két felmérés vizsgálta. A két célcsoportot a közvélemény és az erdőtulajdonosok alkották. A kérdőívek hasonló kérdéseket tartalmaztak, bár két különböző módszertant alkalmaztak – az ún. CATI rendszert a közvélemény esetében és a félig strukturált interjúkat az erdőtulajdonosok esetében. Ez utóbbi részletes kérdéseket tartalmazott az erdőtulajdonra vonatkozóan. A közvéleménytől származó 1503, és az erdőtulajdonosoktól származó 150 válasz összesített elemzése az alábbi témakörökre vonatkozóan történt: tartamos erdőgazdálkodás, főbb ökoszisztéma szolgáltatások, és az erdőkkel kapcsolatos felfogás. A szlovákiai nagyközönség többsége az ökológiai értékeket tekinti az

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erdők legfontosabb elemének, míg az erdőtulajdonosok az erdők fenntartását és fejlesztését szolgáló gazdasági célokat részesítik előnyben. Az erdőtulajdonosok az erdőket jellemzően hetente látogatják, a nagyközönség pedig havonta. Ez utóbbi okainak fontossági sorrendjében első helyen áll a kikapcsolódásra fordítható idő hiánya, amelyet az erdőkkel kapcsolatos érdektelenség követ. Mindkét csoport esetében az erdőlátogatás elsődleges oka a kikapcsolódás. Összességében megállapítható, hogy az emberek többnyire elégedettek a szlovákiai erdőgazdálkodással. Az erdőtulajdonosok meg vannak elégedve az erdőtulajdonukkal, és szándékaik szerint azt a gyerekeik számára hagyják örökölni. A jövőben nagyobb figyelmet szükséges fordítani a fiatal generációk erdőfelfogásának vizsgálatára.

környezeti nevelés / erdők funkciói / ökoszisztéma szolgáltatások / erdőgazdálkodás

1 INTRODUCTION

The awareness of environmental issues in forest management is increasing due to changes in environmental education. According to the national strategy for environmental education adopted in 1996 (revised in 2006), the key factor in environmental education is education and training towards sustainable development. The so called “environmental minimum” contains the following topics: biodiversity maintenance, deforestation and soil erosion, rational use of natural resources, air, water and soil pollution, depletion of the ozone layer, acid rain, greenhouse effect, energy consumption, waste, urbanization, and population explosion (Izakovicova 2010). Forests are an essential component of the landscape and play an important role in environmental education.

Environmental education promotes positive attitudes, and is thus an important natural resource conservation tool. However, education strategies require urgent changes and innovative approaches to meet changing needs. In Slovakia, the persistent preference for teaching methods aimed at gaining verbal knowledge is still present, hindering the use of creative approaches. Pupils often gain theoretical knowledge without a complete understanding of the problems existing within their surrounding environment. They learn about global problems which are difficult to understand. The phenomena and processes occurring in the country are only studied in textbooks, without the possibility of monitoring these phenomena and processes directly.

Schools are an element in the process of change. Schools must promote active interaction among children, teachers, and parents. Future education strategies should start in the family, but must also be addressed in the classroom. Classic teaching approaches must be replaced by alternative methods which enable pupils to participate more actively, subsequently fostering the creativity of the pupil. The shift towards converting knowledge into conscious environmental behaviour is vital. It is necessary to examine people's fears and expectations for the future in order to understand how these perceptions of the future influence the way people behave, and how their current behaviour will influence the future (Hicks and Holden 1995).

Over the past few decades, significant changes have occurred in the views and demands on forests by society at large. This includes an increased level of environmental awareness and recreational interest in Slovakian society (Hajduchova – Sulek 2011). These changes also affect the public's perspective from the traditional role of forests as producers of raw materials. Simultaneously, the urge to re-orient societies towards increasingly “bio-based economies” results in a higher demand for raw material, not only for increasingly sophisticated products, but also for renewable energy (Rametsteiner et al. 2009).

Forests have acquired a new and more global meaning in modern society, going beyond their role as a productive and usable resource. For a growing portion of the population, forests represent a publicly-accessible space for recreation. At the same time, forests are increasingly identified as a natural environment. This new development reflects the needs and preferences of contemporary society, and the desire of an increasingly urban population for recreational

opportunities in natural surroundings. It also reflects public concern over the impending threats to the environment and biodiversity. The wish to preserve a forest is evident in the number of demands for limiting forest exploitation and protecting areas in a close-to-natural state. For many people, the protection of environments and landscapes has become a major criterion for judging the overall performance of forest management strategies (Schmithusen 2007). Currently, a clear need exists to further develop the dialogue between the forestry sector and the general public in order to establish mutually acceptable relations (Lichý 2013).

These changes must also be reflected in forestry education. Forest education is changing in response to shifting international, national, and local perceptions towards forests (Stead 2001), and is necessary to meet the ever-changing needs of society. These needs include a worldwide commitment to sustainable forest management (SFM) and ecosystem-oriented approaches. In agreement with a change of perspective in the management of environmental issues, the process requested for SFM comprehends participatory mechanisms to involve relevant stakeholders (Kangas et al. 2006, Kangas et al. 2010). Therefore, there is an increased need for foresters to have communication skills which would enable them to interact at all levels: from local communities to government and international levels. Foresters should face this new paradigm using a bottom-up approach, rather than the top-down system that has previously characterized forest governance throughout the world – particularly with regards to forestry planning and stakeholder involvement. The bottom-up approach presents a two-way information flow system that considers prior consultation with target groups about their needs, problems, and aspirations for effective forestry planning. On the contrary, the top-down approach is simply a one-way information delivery system that reinforces the hierarchical relationship between the forester and the target group. These changes are not easy to implement or accept, and will require training in social relations in order to meet the growing demand of the public towards forests and their use – especially when it comes to a forest's recreation function (Kumar – Kant 2005). Foresters will no longer be sole agents of information and advice in these situations. Various interest groups such as environmental NGOs, citizens' associations, and municipalities all have an interest in promoting forest use.

The meaning of sustainable forest management has developed from its primary focus on wood production to include a wide range of different combinations of forest uses, meeting economic needs and opportunities while addressing dynamically changing social and cultural values (Schmithusen – Seeland 2006). This introduces new stakeholders into the forest policy-making process. These stakeholders arrive with their own perceptions, values, attitudes, and interests regarding forests and the forest sector (Krott 2005).

For this study, two stakeholder groups were analysed. One group includes the general public while the other group represents forest owners. The aim of this study is to present the results from these two surveys regarding the awareness of the general public and forest owners about forests, sustainable forest management, and ecosystem services.

2 MATERIALS AND METHODS

The perceptions of forests, sustainable management, and ecosystem services were studied by two surveys. The general public and forest owners were the two target groups, and the questionnaires had similar questions. The questions in the surveys were prepared with input from several experts in the field, including academics as well as forestry practitioners. The questionnaire for the general public opinion survey contained 10 questions. The semi-structured questionnaire for forest owners contained 44 questions, including detailed questions regarding forest property. In total, answers from 1503 respondents (general public)

and 151 forest owners were evaluated on following topics: sustainable forestry, major ecosystem services, and the perception of forests.

General public survey

The survey was carried out by a professional agency using the computer-assisted telephone interviewing (CATI) method. CATI is a telephone surveying technique in which the interviewer follows a script provided by a software application. This involves a structured system of data collection by telephone that speeds up the collection and editing of data, permitting the interviewer to educate respondents on the importance of timely and accurate data. The software is capable of customising the flow of the questionnaire based on the answers provided, as well as information already known about the participant.

The results of the public survey include responses collected between January and February 2013. In total, 1503 citizens were contacted via telephone, providing valid responses until February 28th, 2013. The age and residence distribution is shown in the *Tables 1, 2, and 3*.

Forest owners' questionnaire

The questionnaire for forest owners was sent via regular mail to 639 forest owners in June 2013. The target group was private forest owners – preferably members of forest owners associations from different regions of Slovakia. The sampling method represented convenience sampling, so it is therefore not a representative sample of all private forest owners in Slovakia. Therefore, the results must be interpreted with an appropriate level of caution. Respondents were selected using only one criterion defined by the research team: private forest ownership. Data collection was linked to ongoing research activities regarding private forest owners in Slovakia. The return rate was 23% (151) by November 10th, 2013. The age and residence distribution is shown in the *Tables 3, 4 and 5*.

Table 1. Gender distribution of respondents

	General public	Forest owners
Male	777	137
Female	726	14

Table 2. Residence distribution of respondents

	General public	Forest owners
Urban	819	53
Rural	648	98

Table 3. Age distribution of respondents

	General public	Forest owners
18-24	126	0
25-39	385	6
40-54	483	28
55+	509	117

In this study, seven questions (Q) were selected and evaluated. The questions are presented with answers (A) in *Table 4*. Questions were evaluated separately according to their order. The first portion of the questionnaires contained general questions relevant to further sampling, including age, gender, education, and residence. Q22 and 23 were asked only in the questionnaire aimed at forest owners. The answers of both surveys were compared and are presented in figures. Q22 and 23 were evaluated for urban and rural areas because the questions were asked only in the forest owner questionnaire.

Table 4. Selected evaluated questions

General Public Survey Questionnaire		Forest Owners Survey Questionnaire	
Q 4	People have different opinions on why forests should be maintained and enhanced. Which of the listed options do you think should be the most important in Slovakia?	Q 16	Which of the following options explain the importance of owning a forest for you?
A	Economic purpose, ecological values, social aspects, other.	A	Economic purpose, ecological values, social aspects, other.
Q 2	How often do you visit a forest?	Q 18	How often do you visit the forest?
A	Once a week, once a month, never,	A	Once a week, once a month, never.
Q 3a	How do you spend your time in a forest? For what purpose do you go into a forest?	Q 19	How do you spend your time in the forest? For what purpose do you go into the forest?
A	Recreational, NWFP, other.	A	Recreational, NWFP, other
Q 3b	I do not go into a forest because:	Q 20	I do not go into forest because:
A	I don't feel safe in a forest. I have no time. I am not interested in forests.	A	I don't feel safe in the forest. I have no time. I am not interested in my forest.
Q8	People have different opinions on private forest management. In your opinion rate, as in school using a score from 1 to 5, how well do private forest owners and their associations take care of their forest property (with one being the best and five being the worst)?	Q 21	Rate how private forest owners and their associations take care of their forest properties.
A	1, 2, 3, 4, 5.	A	1, 2, 3, 4, 5.
		Q 22	What are your plans for your forest property in the future?
		A	Sell, lease, leave for children, expand, buy new forests, no plans, other.
		Q 23	How do you evaluate your forest property in terms of your expectations?
		A	Satisfied, not satisfied, don't know.

3 RESULTS

An important factor influencing public perception of forests in Slovakia is the right to free access to forests guaranteed by the Forest Act. This implies that visitors are permitted to walk, ski, or cycle on another person's land, as long as landowners' and/or public peace is not disturbed, and fields or plantations are not damaged. In Q4 and Q16, the general public and

forest owners were asked about what the main purpose of forests should be. The majority of the public regards ecological values as the most important (1258 out of 1503), whereas forest owners prefer an economic purpose (83 out of 151).

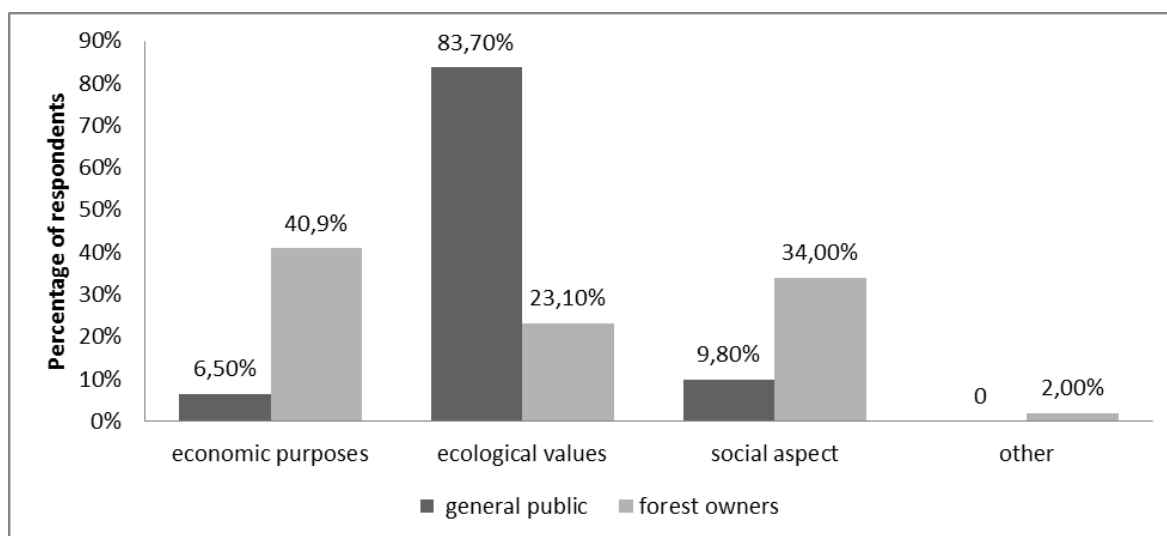


Figure 1. The purposes of maintaining and enhancing forests

The frequency of forest attendance is evaluated in Figure 2. The majority of the general public visits a forest once a month (63.41%, 541), whereas forest owners visit their forest weekly (74.17%, 112). Respondents who do not visit forests at all were mainly from the general public category (122), compared to only one forest owner.

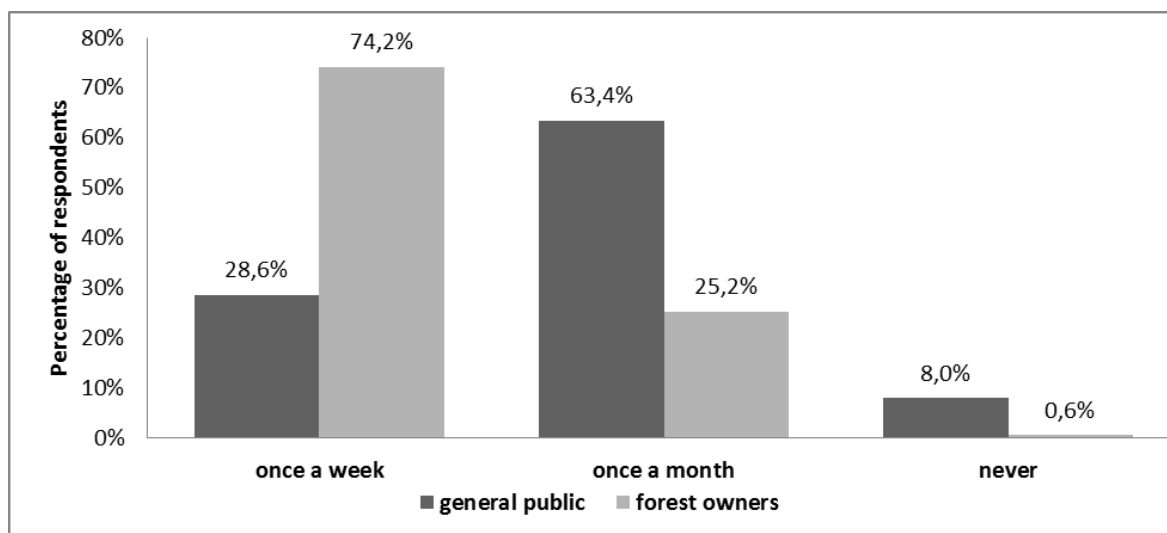


Figure 2. Frequency of forest attendance

The next question is built upon the previous one. When a respondent replied that they never visit forests, they were asked the reason why. The main reason for non-attendance was a lack of free time (68) followed by a lack of interest in forests (46). Only 6% of the general public does not feel safe in forests (Figure 3).

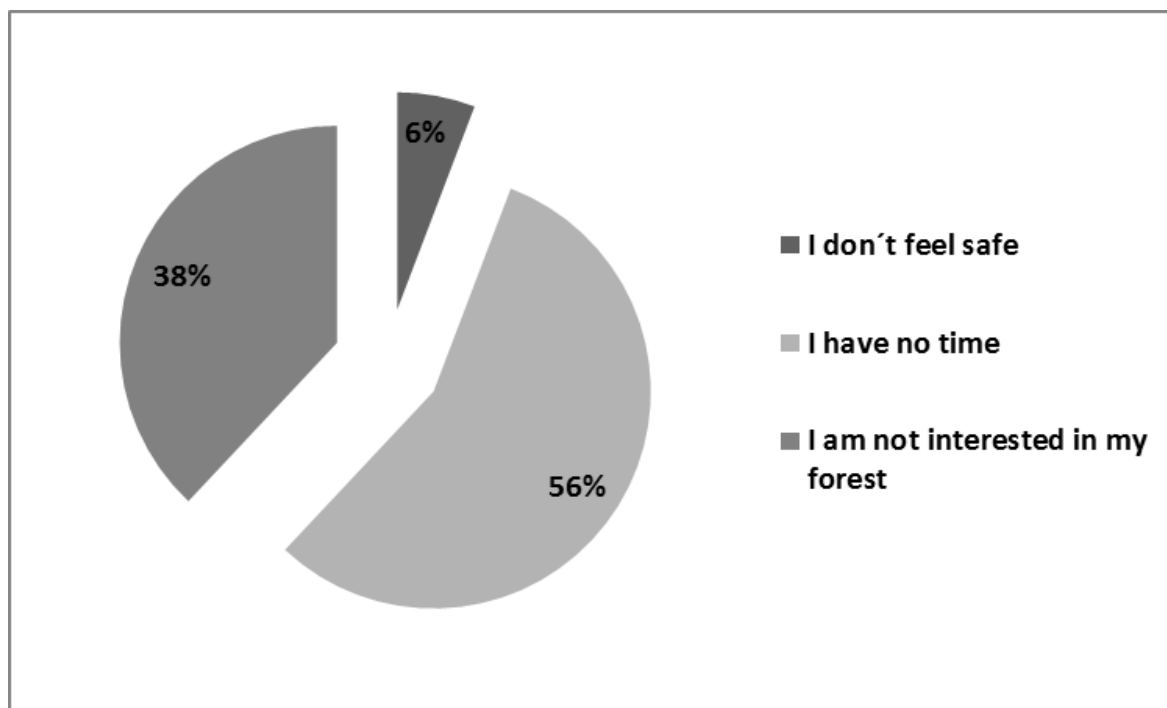


Figure 3. Reasons for not visiting a forest in the general public group

Forests provide a variety of ecosystem services. This question investigated the hierarchy of ecosystem services as perceived by the respondents. The primary purpose for visiting forests for both groups was recreation (79.87% of the public and 68.70% of forest owners), followed by non-wood forest products (Figure 4). The recreational category included the following activities: tourism, sport, rest, and hunting.

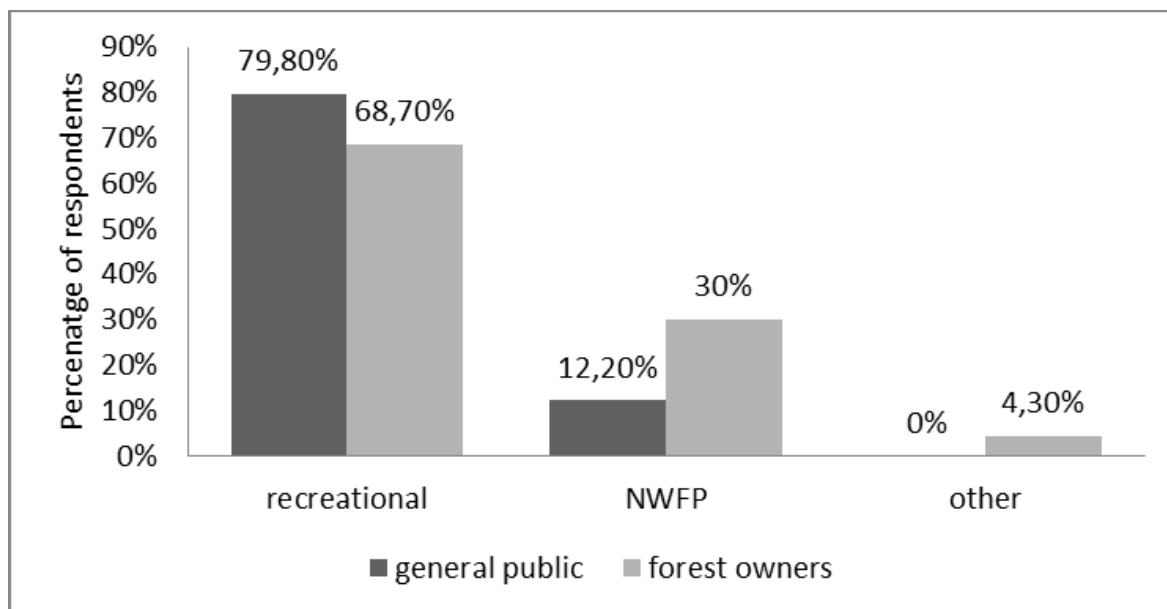


Figure 4. Main ecosystem services that forests should provide

In Q8/21, respondents could rate the forest management conducted by private forest owners. The grading scheme is the same as that of the Slovakian school system, where a score of 1 represents the best and a score of 5 represents the worst. Most of the general public rated the private forest owners with a score of 2 or 3. Most private forest owners marked their management with a score 2, followed by 1 and 3.

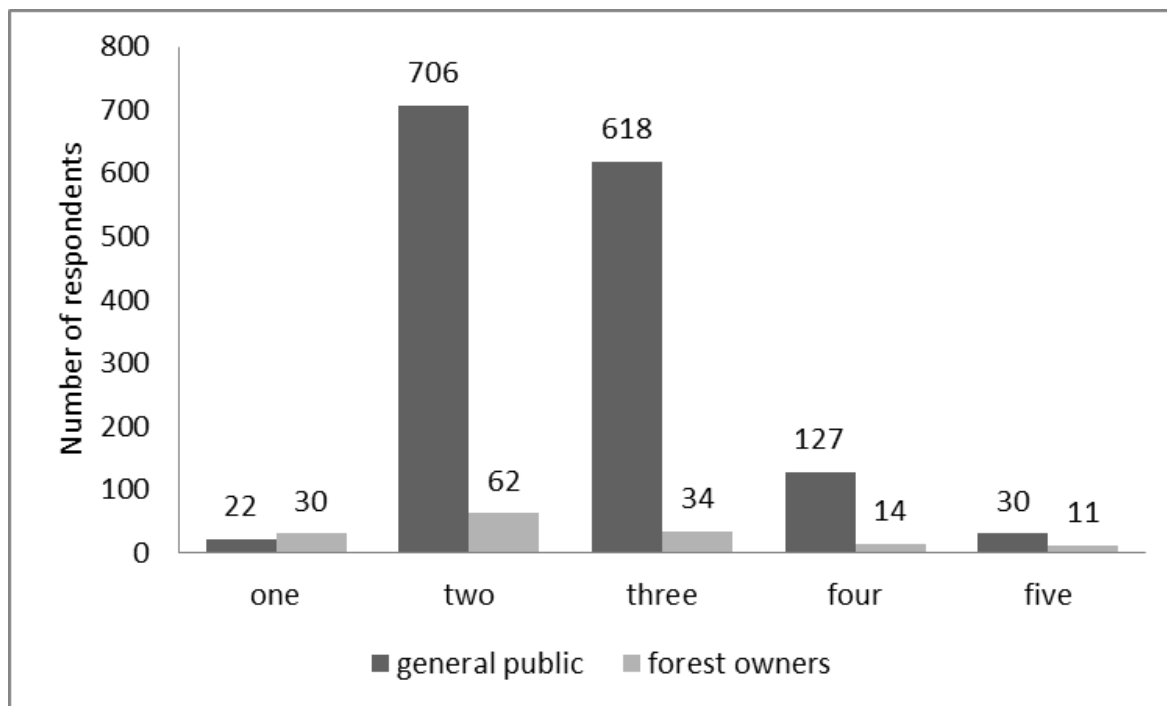


Figure 5. How are private forest owners managing their forests?

The two final questions were asked only in the forest owner questionnaire. The questions regarded the respondents' own forest properties. Table 6 illustrates future forest property plans. The majority of forest owners intend to leave their property for their children.

Table 6. Future plans for forest properties

	Sell		Lease		Leave for children		Buy new forests		No plans		Other	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Urban areas	1	1.9	2	3.8	31	58.5	13	24.5	0	0	6	11.3
Rural areas	0	0	3	3.1	66	67.3	23	23.5	2	2	4	4.1

Most forest owners are satisfied with their property (Table 7). The ownership of forested land meets their expectations. In rural areas, owners are more satisfied with their property when compared to owners living in urban areas.

Table 7. Expectations of the owned forest property

	Satisfied		Discontent		Don't know	
	Total	%	Total	%	Total	%
Urban areas	43	81.1	3	5.7	7	13.2
Rural areas	78	79.6	11	11.2	9	9.2

4 DISCUSSION

Regarding the validity of the research findings, it has to be stated that although the study includes a large sample of the general public population, the questionnaire may have included biases in the selection of respondents. The use of CATI for selection criteria aims at randomizing selection as much as possible, though it presents possible deficiencies (e.g. some people might not have been registered or included in the register). The survey conducted on forest owners is not representative as respondents were selected purposively, so the results must be approached with caution as they are unlikely to be representative of the whole country. However, these results provide valuable insight into the perceptions of forest owners.

The main purpose for visiting forests in Slovakia corresponds to similar research conducted in this area (Rametsteiner et al. 2009), which suggested that the European public places a higher value on forest conservation and the protective functions of forests rather than on forest utilisation aspects. This contrasts forest owners, whose main concern is the economic profit from their property. Public opinion on the productive functions of forests has been studied in many European countries. Previous studies conclude that the general public in typical forestry countries such as Sweden, Norway, or Austria seem to have a more sensitised, pragmatic, and balanced view of the productive functions of forests with regards to the interplay between humans and nature. The general public of eastern and southern Europe tends to view forest functions more from the amenity perspective. In the majority of countries, the public mentioned recreational, educational, and scientific purposes as positive forest functions, while extensive logging, hunting, and construction were generally regarded as negative forest-related activities (Rametsteiner et al. 2009). An overwhelming majority of people in central Europe, for example, link the economic function of forests mainly to the production of wood. In Finland, most private forest owners indicate that financial profit is still important, but they simultaneously classify the recreational uses and aesthetic experiences provided by their forests as almost equally important (Heino – Karvonen 2003).

When it comes to visiting forests, not many of the surveys carried out in Europe asked people how often they did this. In Germany a nationwide quantitative survey concerning forests and forestry was conducted in 2007. In it, 49% of the respondents stated enjoying a visit to a forest. In contrast, only 19% of the questioned German public stated that forests are not interesting for them (Kleinhückelkotten – Wipperman 2007). Of the respondents in Lithuania who had visited forests, 25% said that they visited at least 3-4 times per year (Mizaraitė – Mizaras 2006).

With regard to forest attendance, the results in other European countries are similar to this Slovakian survey. In Germany, 77% of interviewees view the forest as a place for recreation and relaxation; 55% used the forests for recreational walks. Other activities included observing nature (42%), collecting herbs (20%), having barbeques and parties (17%), as well as jogging and 'Nordic walking' (17%) (Kleinhückelkotten – Wipperman 2007). A survey from the Czech Republic stated that the collection of non-wood forest products, such as mushrooms and different kinds of berries, had a high recreational value for visitors (Šišák 2006). The most popular forest activities among Swiss citizens were recreation and various types of sports, followed by the gathering of non-wood forest products (Seeland et. al 2007). Interestingly, in the study conducted by Rametsteiner et al. (2009), recreational purposes were not ranked as one of the top two most important benefits by European citizens. This contradicts previous studies, as well as the expectations of forest experts across Europe (Rametsteiner et al. 2009).

Ecosystem services tend to be more important for people living in central Europe (10.1% rank them as most important element) when compared to other regions. They are considered least important by people in north-western European countries (3.8%). A high variation in in

results can be found within individual countries. Approximately 16% of people in Slovakia rank ecosystem services as most important, followed by Finland (15.3%), and Slovenia (Rametsteiner et al. 2009).

With the development of new environmental education strategies in Slovakia, there is a need to conduct opinion surveys of young people as a target group. Research in other countries which has targeted young people has shown that perceptions, attitudes, and knowledge should represent key components in the preparation of programmes for community education, forest resource management, and conservation (Barrazza – Pineda, 2003).

5 CONCLUSIONS

Slovakia appears to contrast other countries in its inability to face the challenge of creating general acceptance for the forestry sector. In most developed countries, ecological values are becoming more prevalent among the general population, though they are not as evident among private forest owners. Results suggest that people are mostly satisfied with the management of forests in Slovakia. As the results of the public survey have indicated, the general public has expectations with regards to forests and forestry, expecting greater protection and management for ecosystem services (emphasising on ecological values before economic purpose), contrary to forest owners, who stress the economic function.

In the future, younger generations must work to improve their knowledge of forestry and forests. The implementation of educational programs prepared for schools that include elements of forest education support these findings.

In surveys that will take place in the coming years, changes in perceptions on ecosystem services and higher trust in foresters are expected.

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Fostering Adaptation by Changing Landowners' Knowledge Framework – Responses to Extension Education in Northwest Washington State, USA

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Abstract – Landscape urbanization and fragmentation, spread of invasive pests, biodiversity loss, social value changes, and loss of manufacturing infrastructure are some of the changing ecological, economic and environmental framework conditions facing small-scale forest owners in northwest Washington State, USA. To successfully adapt to these changes, landowners' knowledge framework must change. Washington State University Extension has been offering comprehensive, multi-week training courses for small-scale forest owners. From 2008 – 2013, participants were surveyed at the conclusion of the training, one year following the training, and again at three years following the training. These follow-up surveys demonstrate a progression from knowledge change to behaviour (management) change and, ultimately, to condition change. Condition changes included increased wildlife diversity, decreased invasive species cover, and increased economic sustainability. The results demonstrate that changing a landowner's knowledge framework through education is a highly-effective approach for helping them successfully adapt to changing external framework conditions.

forestry / Extension / evaluation

Kivonat – Az alkalmazkodóképesség elősegítése a földtulajdonosok gondolkodási keretének megváltoztatásával – Észak-nyugat Washington Állam (USA) továbbképzéseinek eredményei. A tájkép beépülése és feldarabolódása, az őzönállatok terjedése, a biodiverzitás csökkenése, a társadalmi értékek és a feldolgozási infrastruktúra átalakulása azok az ökológiai, gazdasági és környezeti keret-tényezők, amelyekkel a kisterületű erdőtulajdonosoknak szembe kell nézniük Washington Állam (USA) északnyugati részében. A változásokhoz történő sikeres alkalmazkodás érdekében a földtulajdonosok gondolkodási kereteinek is változni kell. A Washington Állami Egyetem továbbképzései átfogó, többhetes kurzusokat ajánlanak a kisterületű erdőtulajdonosok számára. 2008 és 2013 között a résztvevők felmérésben vettek részt közvetlenül a képzés lezárásakor, majd azt követően 1 és 3 év múlva. Ezek az után-követő felmérések bemutatják a megszerzett tudás átalakulását magatartássá, majd végső soron a peremfeltételek megváltozásává. Ez utóbbi magában foglalja az állatvilág változatosságának növekedését, az őzfajok csökkenését és a gazdasági fenntarthatóság növekedését. Az eredményeken keresztül látható, hogy a tulajdonosok gondolkodási kereteinek oktatással történő megváltoztatása kiemelkedően hatásos módja annak, hogy segítsük őket a változó külső keretfeltételekhez történő alkalmazkodásban.

erdőgazdálkodás / továbbképzés / értékelés

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1 INTRODUCTION

Small-scale forest owners in northwest Washington State, USA face a variety of changing ecological, economic, and social framework conditions. Expanding urbanization is resulting in the loss and fragmentation of the forest land base (Bradley et al. 2007). A changing regulatory framework, in response to concerns about water quality and salmon habitat, increases the complexity and decreases the profitability of forest management on small ownerships (Zobrist – Lippke 2003). Changing log markets and manufacturing infrastructure are resulting in changing management trends (e.g. Mason 2003). Other issues such as invasive species and available wildlife habitat are cited by landowners as additional areas of concern (Zobrist – Rozance in press (a)).

Changing landowners' knowledge framework through education can help them adapt to these changing conditions. Landowners identify education and technical assistance as preferred methods for helping them implement good forest management practices (Jones et al. 1995, Kilgore et al. 2007). This study examines whether a forest landowner education program effectively changes landowners' knowledge framework in a way that subsequently leads to behaviour and condition changes (i.e. adaptation to changing framework conditions).

2 BACKGROUND

Forest Stewardship Coached Planning is one of the flagship landowner education and outreach programs offered by Washington State University (WSU) Extension. The program is done in partnership with the Washington Department of Natural Resources (DNR), the United States Forest Service (USFS), and other state and local partners. The program is offered several times per year at different locations around the state, reaching thousands of family forest owners since its inception in 1992 (Baumgartner et al. 2007). Coached planning is typically seven to nine weeks in length and includes class sessions one evening per week, a Saturday field day, and a site visit to each participant's property by a state service forester, usually from the DNR.

Coached Planning is a comprehensive education course that covers a broad spectrum of topics including species identification, stand dynamics, soils, forest health, wildlife, invasive species, silviculture, regulations, water quality, forest inventory, wildfire, and special forest products. The course is focused on coaching landowners in the writing of their own forest stewardship plans (also called management plans) that encompass all of these topics and provide a roadmap for successful management and adaptation. The writing of stewardship plans, coupled with site visits from state service foresters, helps participants synthesize class information and apply it to their individual properties. Downing and Finley (2005) found that learning information that applies to an individual's personal situation is important to landowners. In Washington, management plans have additional benefits, as qualifying landowners can use their plans to meet eligibility requirements for cost share assistance, preferential property tax treatment, and forest certification (Zobrist 2011).

Washington's Forest Stewardship Coached Planning program, along with the corresponding technical assistance from DNR foresters, has been supported in part by the USFS Forest Stewardship Program, a nationwide initiative launched in 1991 to promote written stewardship plans for small-scale forest owners. In many states, funding from this program has been used to provide landowners with professionally-prepared plans. A few states, like Washington, offer the coaching option for landowners to self-prepare plans (Esseks – Moulton 2000).

In the period from 2008 – 2013, 12 coached planning classes were offered in various locations across four northwest Washington counties: King, Snohomish, Skagit, and Island. Two additional classes were offered online in a webinar format. This region, which includes most of the Seattle metropolitan area, has over 50,000 small forest landowners managing over 167,000 hectares of forest (Rogers – Cooke 2009). The total attendance for these classes was 507 people representing 333 families or organizations. Most attendees were family forest owners, but there were several attendees representing municipalities and non-profit organizations related to land stewardship.

3 METHODS

Evaluations were done at four different times: midway through the course, at the end of the course, one year after the course, and three years after the course. The evaluations midway through and at the end of the course collected feedback about the first and second halves of the class, respectively. These evaluations were done for each of the 14 classes, though data for one class in 2011 is missing and not included in this study. In addition to gathering feedback to improve future classes, the purpose of these evaluations was to assess short-term impacts of knowledge change due to the course. This was done as a retrospective pre-test (also called a then-test), coupled with a post-test, asking participants to rank their before and after knowledge of different course topic areas using a five-point Likert scale, with one being not knowledgeable and five being very knowledgeable. A two-sample t-test was used to test for significant differences between the results of the retrospective pre-test and the post-test.

A retrospective pre-test was chosen because of an expectation of a strong response-shift bias with a true pre-test. This bias is introduced when participants recalibrate their perception of their knowledge based on what they learned. This can result in an underestimate of gains, and in some cases the post-test scores may even be lower than the pre-test scores, as participants find there is much more they do not know about a topic than they realized before the education event. This phenomenon was observed when evaluating a past program, and program participants have commonly expressed things like “I did not know what I did not know.”

The one-year and three-year post-class evaluations were done as mail surveys. One-year evaluations were done for 11 classes from 2008 through 2012. Three-year evaluations were done for five classes from 2008 through 2010. The survey method was roughly based on the Tailored Design Method proposed by Dillman (2007). A pre-notice was sent a few days in advance by email. The survey was then sent by mail along with a cover letter and postage-paid return envelope. A thank you and reminder letter was sent by mail, along with a new copy of the survey and a new postage-paid return envelope, two weeks after the first mailing. A second reminder letter was sent two weeks after the first reminder, also with a new copy of the survey and a new postage-paid return envelope. Thank you and reminder emails were also sent one week after the first survey mailing and one week after the first reminder letter mailing. Only those participants who agreed at the beginning of the course to participate in follow-up surveys and who provided a valid mailing address were surveyed. Only one survey was sent per household.

The focus of the one-year survey was on behaviour change due to taking the course. The survey included questions about whether participants used new knowledge from the course to complete a stewardship plan, implement stewardship practices, and/or share information with others. A chi-squared test was used to compare the behaviour change between those who completed a written stewardship plan and those who did not. The one-year survey also included questions about whether the course increased participants' enjoyment of their forest

land, their understanding of the ecological importance of their forest land, and their likelihood of utilizing the services of a professional forester if harvesting timber.

The focus of the three-year survey was on condition change. Participants were asked if they had a stewardship plan and, if so, how often they referred to it. Participants were asked if they observed increased wildlife use or decreased invasive species cover after implementing practices using knowledge gained from the course. Participants were asked if they used course knowledge and/or their stewardship plan to sell any timber or non-timber products, enrol in a cost share program, or enrol in a preferential property tax program. Participants were also asked if their comfort and confidence as landowners and their overall quality of life as landowners had improved due to taking the course.

4 RESULTS

4.1 Knowledge self-assessment results

Table 1 summarizes the mean self-assessment responses for topic knowledge before and after the course. Not every topic was covered in every class, and knowledge of how to write a stewardship plan was not surveyed before 2011, so some *n* values are noticeably lower than others. All topics showed a mean knowledge gain of at least 1 point (on a scale of 1 to 5), and all gains were significant at $\alpha = 0.01$. How to write a stewardship plan showed the greatest knowledge gain, followed by forest inventory and timber sale management. Native trees, wildlife, and invasive species showed the smallest gains, but these topics also had the highest levels of pre-class knowledge.

Table 1. Mean topic knowledge rating before and after the course, on a scale of 1 (not knowledgeable) to 5 (very knowledgeable)

Topic	Before the course			After the course			change	t	p
	Mean	SD	n	Mean	SD	n			
Native trees	2.64	1.15	257	3.89	0.81	255	1.25	14.23	<.001*
Wildlife	2.67	0.97	254	4.08	0.71	252	1.41	18.68	<.001*
Invasive species	2.40	1.05	200	3.97	0.73	201	1.57	17.38	<.001*
Forest taxes	1.98	1.11	170	3.56	0.93	168	1.59	14.16	<.001*
Stand dynamics	2.21	1.07	277	3.80	0.72	272	1.59	20.32	<.001*
Forest soils	1.89	0.97	289	3.52	0.74	283	1.63	21.49	<.001*
Silviculture	1.94	0.92	258	3.64	0.96	253	1.70	20.47	<.001*
Importance of plans	2.39	1.24	269	4.13	0.80	268	1.74	19.34	<.001*
Regulations	1.78	0.94	220	3.53	0.77	220	1.75	21.31	<.001*
Non-timber products	1.99	0.93	247	3.75	0.77	247	1.75	22.83	<.001*
Forest health	2.07	0.91	258	3.86	0.70	255	1.79	25.01	<.001*
Timber sale	1.44	0.81	108	3.36	0.86	107	1.93	16.89	<.001*
Forest inventory	1.88	0.94	120	3.82	0.74	119	1.94	17.73	<.001*
Plan writing	1.45	0.84	131	4.08	0.74	131	2.63	26.79	<.001*

* Significant at $\alpha = 0.01$

4.2 One-year follow-up results

The one-year follow-up surveys were sent to 234 households who agreed to participate and provided valid contact information (87.3% of 268 originally participating households). There were 209 responses (89.3% response rate). *Table 2* summarizes participant responses.

Approximately 65% completed a written plan, and over 90% used course knowledge to implement stewardship practices. Practices implemented are summarized in *Table 3* and *Table 4*. Wildlife habitat enhancement, invasive weed control, and fire risk reduction practices were applied to the greatest total area, and trail building was applied to the greatest total distance. Wildlife habitat enhancement, invasive species control, and tree planting were applied by the greatest number of respondents.

Table 2. Summary of participant responses in the one-year follow-up evaluation

	No	Yes	% yes
Completed a stewardship plan	71	131	64.9
Implemented practices using course knowledge	20	184	90.2
Shared course knowledge with others	8	199	96.1
Increased enjoyment of property	21	187	89.9
Increased understanding of ecological importance of property*	15	124	89.2
Increased likelihood of using a professional forester when harvesting timber**	9	92	91.1

*Asked of 2009 and later classes

**Asked of 2010 and later classes

Table 3. Stewardship practices applied within one year using course knowledge

Practice	Participants implementing	Area treated (ha)
Regeneration harvest	26	30.6
Commercial thin	7	63.5
Animal damage protection	44	101.1
Pre-Commercial thin	40	138.8
Pruning	64	137.3
Other vegetation control	87	159.8
Tree planting	92	162.8
Fire risk reduction	71	238.1
Invasive weed control	126	288.1
Wildlife habitat enhancement	100	491.2
Total		1811.8

Table 4. Kilometres of stewardship practices applied within one year of the course

Practice	Participants implementing	Distance treated (km)
Streamside habitat improvement	31	22.8
Road improvement	30	33.1
Trail building	63	84.3

Of those who completed a stewardship plan, 94% implemented stewardship practices using course knowledge compared to 86% of those who did not complete a stewardship plan (*Table 5*). The results of the chi-squared test indicate that this difference is significant at $\alpha = 0.10$, but just barely insignificant at $\alpha = 0.05$ ($\chi^2=3.81$; $p=0.051$).

Table 5. Comparison of practices implemented between those who did and did not complete plans

	Completed a plan	
	Yes	No
Implemented practices	122 (94%)	59 (86%)
Did not implement practices	8 (6%)	10 (14%)

Approximately 96% of respondents reported sharing course information with others in the year following the course. The total number of people that respondents reported sharing with was 2,212, which is an average of approximately 11 people per participant who shared. Approximately 90% of participants reported that the course resulted in a greater enjoyment of their property, a greater understanding of its ecological importance, and a greater likelihood of utilizing a professional forester if harvesting timber.

4.3 Three-year follow-up results

For the three-year follow-up surveys, surveys were sent to 123 households who agreed to participate and provided valid contact information (86.0% of 143 originally participating households). There were 101 responses (82.1% response rate). *Table 6* summarizes participant responses. The percent of respondents with completed plans increased to 85.9% at the three-year mark. Those who completed a plan reviewed it an average of 1.4 times per year. Over half of the participants observed increased wildlife use and decreased invasive species cover due to practices implemented using course knowledge. Almost all respondents reported that the course increased their comfort and confidence as a forest owner and decision maker, and that the combination of course impacts increased their overall quality of life.

Table 6. Summary of participant responses in the three-year follow-up evaluation

	No	Yes	% yes
Completed a stewardship plan	14	85	85.9
Increased wildlife use observed	37	49	57.0
Decreased invasive species cover	30	57	65.5
Sold products using course knowledge	69	17	19.8
Enrolled in a cost share program	65	12	15.6
Enrolled in preferential tax program	34	47	58.0
Increased comfort/confidence as forest owner	0	95	100
Increased quality of life	3	87	96.7

Over half of the respondents used their stewardship plan to enrol in a preferential property tax program for forestry. Those who did reduced their property tax liability by an average of \$1,489 USD per year. Fewer than 20% of respondents reported using course knowledge to sell timber or non-timber products or enrol in a cost share program. Those who sold products generated a combined total of \$516,243 USD in income. Those who enrolled in a cost share program received a combined total of \$42,710 USD in cost share funds. When asked to rank their likelihood of converting their property to non-forest use before and after taking the course (highly unlikely, unlikely, neither likely nor unlikely, likely, very likely), 30.8% reported a lower likelihood, 3.3% reported an increased likelihood, and 65.9% reported no change. Of those who reported no change, all were either unlikely or highly unlikely.

5 DISCUSSION

5.1 Knowledge change

The results of this study suggest that education through the Forest Stewardship Coached Planning course successfully changes the knowledge framework of small-scale forest owners in northwest Washington State. Knowledge gains were significant across all 14 topics. The extent of these gains should be viewed with some caution. Although a retrospective pre-test can be used to counter response-shift bias, it introduces different biases that can result in overestimating the effect of a program, especially when measuring a socially-desirable outcome like knowledge gain (Hill – Betz 2005). Thus, these results should be viewed with an understanding that they represent participants' subjective views of how they have changed. Future studies may warrant different methods to reduce or better understand potential biases. The results of this study show that the greatest knowledge increase is in how to write a forest stewardship plan, which reflects the overall emphasis of the course. The one-year follow-up results show that participants share their new knowledge with an average of 11 people per person in the first year after taking the course, which represents a multiplying of the knowledge change. Further study to investigate the impact of this indirect influence of the course would be beneficial.

5.2 Behaviour change

The one-year evaluation results indicate a progression from knowledge change to behaviour change, with 90.2% of respondents reporting using knowledge gained from the course to implement stewardship practices on their property. This is higher than the 73% reported in a 14-year state-wide retrospective study of the program done by Baumgartner et al. (2007). However, that study asked the question differently, asking about practices that the landowner would not have done otherwise. This study asked in more general terms about practices implemented using course knowledge. There may have been practices that the landowner would still have done if not for the course, but that the practice was done differently through the application of course knowledge. Both cases indicate a behaviour change for the vast majority of participants.

This study found that plan completion rates, especially after three years, are higher than the 61% reported by Baumgartner et al. (2007). It is unknown why the 2008–2012 results are higher than those from 1992–2005. This could reflect improvements to the course, changes in instructors, or region-specific differences between northwest Washington and the rest of the state. Respondents in this study on average reviewed their plans at least once per year. This is similar to a study by Elwood et al. (2003) in the neighbouring state of Oregon that found that all participants used their plans at least annually. In contrast, the results of this study are quite different than a study in West Virginia that found that less than 20% of participants in a forest stewardship program referred to their plans regularly (Jennings – McGill 2005). The reason for this stark difference is unknown. In West Virginia, stewardship plans are written for landowners by professionals, whereas in this program the landowners write the plans themselves. This could indicate that self-prepared plans get greater use, or that management plans done in conjunction with education get more use. This is an area for future study.

The groups of respondents who did and did not complete a stewardship plan both had high rates of implantation of stewardship practices after one year (94% and 86%, respectively). The difference in practice implementation rate between the two groups is significant at $\alpha = 0.10$, but insignificant (albeit barely) at $\alpha = 0.05$. That both groups have implementation rates greater than 85% is perhaps more notable than any difference between them, though, especially since the finding of a higher rate of implementation for those who

completed plans does not establish a cause and effect relationship. These results suggests that the education and assistance aspects of the Coached Planning program drive behaviour change more than writing a stewardship plan. This calls into question whether the production of management plans is the best policy focus when it comes to landowner outreach and assistance, especially when plans are done by professionals and not coupled with landowner education. Further study is needed to understand the most effective drivers of change.

5.3 Condition change

The three-year evaluation results suggest a progression from knowledge and behaviour change to condition change. Over half of the respondents reported increased wildlife use and decreased invasive species cover on their property after implementing practices using knowledge gained from the course. The wildlife observations should be treated with some caution, as participants may simply be more aware or observant of wildlife use based on what they learned in the class. The decrease in invasive species cover, however, is likely to stem from practices implemented to control these species. This represents an important adaptation to one of the changing ecological framework conditions (the spread of invasive species) facing small-scale forest owners.

Unlike the one-year follow-up survey, the three-year survey did not ask respondents if they implemented specific practices like wildlife habitat improvement or invasive species control. Thus, these results do not connect specific practices with outcomes. As such, these results are not indicative of the effectiveness of specific practices, but rather are indicative of the impact of the program as a whole relative to these specific areas of interest.

Another adaptation seen in the three-year results is economic adaptation. Over half the participants used course knowledge to get their property enrolled in a preferential property tax program for forestry, saving \$1,489 USD per year on average. Forest land that is taxed based on highest and best use rather than forestry use can be a significant impediment to economic sustainability (D'Amato et al. 2010). Forest landowners have cited property tax burdens as a key factor influencing them to parcel their property or sell it (Butler et al. 2010, Stone – Tyrrell 2012). Studies in the U.S. have found that many landowners are not aware of preferential property tax programs for forestry (Rathke – Baughman 1996, Williams et al. 2004, Fortney et al. 2011, Van Fleet et al. 2012). Education about these opportunities, coupled with education about how to write the management plan that is often required for enrolment, can play a significant role in getting landowners enrolled.

This study revealed another economic adaptation, which is using course knowledge to generate income from the sale of timber and non-timber forest products. Fewer participants (approximately 20%) pursued this compared to those pursuing preferential tax treatment. This is not unexpected, since generating income is not a high ownership value for landowners in northwest Washington (Zobrist – Rozance 2014). Nevertheless, these participants generated over a half a million USD of new income using course knowledge, which is important for economic sustainability and rural economic development.

5.4 Potential impact on forest conversion rates

Getting more landowners enrolled in preferential property tax programs may not achieve the policy goals of good land stewardship and reduced forest conversion. While landowners consistently claim that property taxes are one of their top concerns and a driving factor for parcelization and conversion (e.g. Butler et al. 2010, Stone – Tyrrell 2012), empirical results from studies of actual landowner behaviour are mixed. A 1999 study in the state of Tennessee found no difference in intention to change land use within ten years between those who were enrolled in a preferential property tax program and those who were not (Brockett – Gerhard

1999). While property taxes have been linked empirically to parcelization and conversion, these land use changes are inelastic relative to property taxes, such that lowering property taxes has a disproportionately small impact on slowing parcelization and conversion (Polyakov – Zhang 2007, Poudyal – Hodges 2009). Butler et al. (2010) observed that focus group participants, when unprompted, did not cite property taxes as a key problem nearly as much as they did after they were informed that the study was about tax policies. These studies suggest that, when it comes to conversion and parcelization choices, property taxes are not as great of an influence as landowner testimonials would indicate.

Almost all respondents in this study (89.9%) reported an increased understanding of the ecological importance of their property due to taking the course. This may be important, as Wadsworth (1999) found that landowners who believe their forest land has an impact on the larger landscape were less associated with an intention to sell or subdivide their property due to financial reasons. That study does not demonstrate cause and effect, though, so increasing ecological understanding does not necessarily lead to a lower likelihood of property sale or conversion. When asked directly to rank their likelihood of converting their land to development before and after the course, 30.8% reported a lower likelihood while 65.9% reported no change. Those who reported no change were already unlikely or very unlikely. This brings up another important issue, which is that participants self-selected into the Coached Planning program and thus may represent a biased sample that is more inherently concerned with ecosystem services and land preservation.

Almost all respondents reported greater enjoyment of their property; greater comfort and confidence as forest owners; and greater overall quality of life. These factors may lead to participants maintaining ownership of their property longer or taking additional steps to protect their forest land from development (e.g. conservation easements). Such outcomes are currently unknown, though, and offer opportunities for further study.

6 CONCLUSIONS

Overall, this study suggests that education is a successful strategy for changing landowners' knowledge framework in a way that fosters adaptation to a variety of changing conditions. This study finds that the Forest Stewardship Coached Planning program in northwest Washington State, USA, significantly increases landowner knowledge across 14 topic areas. This leads to subsequent behaviour change, which ultimately results in condition changes that represent successful economic and ecological adaptations that improve landowner quality of life. The Forest Stewardship Coached planning program, which combines classroom and field-based education with stewardship plan writing and direct technical assistance, appears to be a highly effective landowner education and outreach model. Education and assistance may be more important factors than management plan writing when it comes to behaviour change, and there are opportunities for further study to explore this as well as gain a better understanding of cause and effect relationships when assessing the impacts of education and outreach programs.

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Natural Resource Enterprises: Payments to Landowners for Ecosystem Services from Forests and their Management in the United States of America (U.S.)

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Abstract – Mississippi landowners were found to diversify incomes from forests through fee-access outdoor recreation, including hunting, angling, wildlife watching, and other nature-based activities (Jones et al. 2005). The Natural Resource Enterprises (NRE) Program at Mississippi State University educates private landowners, resource agencies, and local communities about recreational enterprises, conservation, and integration of these activities with sustainable forestry through educational workshops. Since 2005, the NRE Program has organized and conducted over 75 landowner workshops in 11 U.S. states and Sweden and trained in excess of 4,000 participants in outdoor recreational business development and associated conservation practices. Survey results revealed that our programming has initiated over 1,000 new outdoor recreational businesses on an estimated 1.2 million hectares of forest and agricultural lands, generating over \$14 million in incomes while fostering natural resource conservation on family farms in the U.S. NRE development on rural lands benefits landowners and local communities through promoting payments for ecosystem services supported by sustainable forests.

sustainability / forest management / landowners

Kivonat – Ökoturisztikai vállalkozások: Díjfizetés a földtulajdonosok számára az erdőből és az erdőgazdálkodásból származó ökoszisztéma szolgáltatásokért az Amerikai Egyesült Államokban (USA). Mississippi földtulajdonosok díjfizető természetközeli kikapcsolódási lehetőségekkel, például vadászattal, horgászattal, vadvilág megfigyeléssel és más természethez kapcsolódó szolgáltatásokkal diverzifikálták bevételeiket (Jones et al. 2005). A Mississippi Állami Egyetemen működő Ökoturisztikai Vállalkozások Program (ÖVP) műhelybeszélgetéseken keresztül tart képzéseket földtulajdonosok, ügynökségek és a helyi közösségek képviselői számára az ökoturisztikai vállalkozások, a természetvédelem és ezek erdőgazdálkodással történő integrálása témakörében. 2005 óta az ÖVP 75 műhelybeszélgetést szervezett meg és hajtott végre az USA 11 államában és Svédországban, és 4000-ret meghaladó résztvevőt képzett az ökoturisztikai fejlesztés és a kapcsolódó természetvédelmi tevékenységek témakörében. Felmérési eredmények felfedték, hogy a program révén 1000 új ökoturisztikai vállalkozás indult el 1,2 millió hektárra becsült erdő és mezőgazdasági területen, 14 millió USD bevételt generálva, miközben a természeti erőforrások védelmét is elősegítette az USA családi agrárvállalkozásaiban. Az ÖVP fejlesztés a vidéki térségekben a tartamos erdőgazdálkodás ökoszisztéma szolgáltatásaiért történő díjfizetések ösztönzésével a földtulajdonosok és a helyi közösségek számára is hasznot hajt.

tartamosság / erdőgazdálkodás / földtulajdonosok

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INTRODUCTION

Ecosystem services can be defined as the direct and indirect contributions of ecosystems to human well-being (Economics of Ecosystems and Biodiversity 2010). These services support human survival and life qualities in a number of ways. Ecosystem services can be categorized in four primary types, including provisioning, regulating, habitat, and cultural services. Provisioning services are products from ecosystems, such as food, water, wood, fiber, genetic, and medicinal attributes. While regulating services are benefits to society from ecosystems including climate regulation, natural hazard regulation (i.e., coastal zone protection from hurricanes and typhoons resulting from coastal wetlands, water quality and quantity attributes from watersheds, waste management, and environmental benefits to agriculture (pest control and pollination)). Habitat services refer to wildlife and fisheries habitats within ecosystems that enhance biodiversity of species and genetic variability among individual species. Lastly, cultural services are societal benefits derived from healthy ecosystems, such as spiritual and religious enrichment, scholarly enrichment, outdoor recreation, and aesthetic values of the environment. Natural resource conservation, stewardship, and wise-use land management practices can provide these ecosystem services to society, particularly when commercial and private landowners are given economic incentives to manage lands in environmentally friendly ways.

Outdoor recreation, including recreational hunting, angling, wildlife watching, and ecotourism is one avenue that incentivizes natural resource conservation and sustainable land-use practices on private lands in the U.S. while providing ecosystems services benefitting society at large. Demand for quality outdoor recreation is popular throughout the world. U.S. citizens (87.5 million) spent over \$145 billion (U.S. dollars) on wildlife-related recreation in 2011 (U.S. Department of the Interior 2011). Past research found that revenues collected in 1998 from fee-access hunting on private lands in Mississippi ranged from \$2,964 to \$5,254 on average per landowner who offered access to property or \$7.50 – \$14.28/ha, depending upon the region of the state evaluated. Net revenues averaged from \$1,539 to \$3,244 per landowner who provided hunting access or \$3.95 to \$9.66/ha (Jones et al. 2005). During 2005–2008, outdoor recreation increased Mississippi rural property values by 52% or \$1,615/ha and those tracts that were leased for recreational hunting averaged over \$61/ha (Brashier 2014). Property characteristics that statistically influenced sales prices of rural tracts were hectares comprised of diverse land covers dominated by forested and agricultural lands. Expenditures for outdoors recreation (hunting, angling, wildlife watching, horse trail riding, and other nature-based outdoor activities) were estimated at \$2.7 billion in economic returns to the State of Mississippi in 2008 (Henderson et al. 2010). Despite the economic and environmental benefits of fee-access outdoor recreation, only 10–14% of Mississippi private landowners participated in these businesses on their properties, primarily due to concerns in accident liability and perceived incompatibility with traditional forestry and agricultural land uses (Jones et al. 2005). Similar trends in revenues and land values associated with fee-access wildlife and fisheries recreation have been documented in other southern U.S. states (Richardson et al. 1992, Richardson et al. 1996).

Marginal lands, such as agricultural field borders, wetlands and wetland forests, and forested riparian corridors along watersheds, are often difficult to farm or manage for timber production due to flooding problems or regulatory restrictions (National Research Council 1992). However, these properties are ideal for conserving wildlife and fisheries habitats and can be readily enrolled in fee-access recreational businesses and governmental cost-share assistance programs. Revenues from fee-access recreation on private lands were substantially greater on forested and managed agricultural lands, particularly bottomland hardwood forests and forested riparian buffers along watersheds. This finding reveals that private landowners

can generate income from conservation and restoration of lands that were marginal for forestry, agriculture, or development (Jones et al. 2005, Jones et al. 2008). Additionally, these lands provided ecosystem services that benefit local and regional communities. This study also revealed that fee-access recreation and associated wildlife habitat conservation often times promoted by governmental cost-share assistance programs were compatible with agriculture and forestry, thereby providing incentives to landowners to diversify natural resource enterprises on their properties that encourage land and water conservation.

Natural resource enterprises may include diverse outdoor activities, wildlife-related recreation, and associated amenities such as hunting, angling, wildlife watching, agritainment or farm tours, horse trail riding, and rural bed and breakfast accommodations. Establishing these types of enterprises on family forests and farms provide multiple benefits and ecosystem services that include the diversification of income streams for rural families, land ownership retention, conservation and stewardship of the land, improved watershed integrity, high quality habitats for wildlife and fish, reduced regulatory measures for environmental protection (state and federal wetland regulatory protection programs), and sustainable rural development (Jones et al. 2005, Jones et al. 2008).

NATURAL RESOURCE ENTERPRISES PROGRAM

The Natural Resource Enterprises Program (NRE) (www.naturalresources.msstate.edu) was established in the Department of Wildlife, Fisheries, and Aquaculture and Cooperative Extension Service at Mississippi State University to educate rural landowners in the U.S. about fee-access recreational business development, wildlife and fish habitat management on farm and forest lands, and compatible land-use practices. Historically in the U.S., educational materials for natural resource enterprise development, though available, have been difficult to locate. As a result, landowners may not be aware of training opportunities and resources available. Working with program partners, we have developed educational workshops, demonstrations, and resources to inform landowners, agency professionals, and community leaders about enterprise opportunities, wildlife habitat management, and sustainable land uses on private lands. The NRE Program partners with federal resource agencies and state land-grant universities, farm bureaus and agricultural trade organizations, U.S. state agencies, non-governmental organizations, and private-sector firms. Partners are actively trained in NRE and land management approaches and participate in workshops. Through these partnerships, we offer on-the-ground educational demonstrations and workshops to assist private landowners in outdoor recreational business development and conservation practices on their lands to enhance natural resources, including wildlife and fish and their associated habitats.

WORKSHOP PROGRAMMING

NRE workshops provide participants with the opportunity to learn from and interact with resource and agency professionals and existing operators of successful outdoor recreational businesses. We conduct workshops on properties that are currently in forestry or agricultural production and that also support a fee-access outdoor recreational enterprise.

During workshops, participants are given learning experiences including instructional lectures from resource professionals and field tours on properties with a fee-access recreational business. During lecture sessions, speakers from universities, resource agencies, and organizations discuss topics, such as revenue potential from outdoor recreational

enterprises, business planning and management, legal considerations and liability reduction, governmental cost-share assistance, and habitat management considerations on the farm.

Attendees tour properties hosting events during afternoon sessions to observe enterprise operations and wildlife and fisheries habitats management integrated with forestry and farming practices. Each workshop attendee receives educational materials about enterprise operations, business management and marketing, liability reduction, wildlife and fisheries habitat management, cost-share assistance programs, and other topics pertinent to establishing and managing an enterprise.

PARTICIPATION

Workshops have been well received by past landowner, resource agency, and community leader participants. From 2005 to 2014, the NRE Program and partners have conducted over 70 landowner workshops and demonstrations in 11 U.S. states, including Alabama, Arkansas, Indiana, Louisiana, Michigan, Minnesota, Mississippi, Oregon, South Carolina, Tennessee, and Texas. Attendance at these events has been exceptional with over 4,500 participants, including an estimated 4,000 landowners with landholdings located in 16 U.S. states. The program participated in a conference and series of workshops sponsored by Lunds University (Dr. Marie Appelstrand) and the Swedish Forest Agency in 2009 to promote fee-access outdoor recreational enterprises within local communities in central Sweden.

To evaluate impacts from workshops, participants were mailed a comprehensive survey entitled Natural Resource Enterprises Landowner Survey that requested information about land-use practices, NRE businesses and conservation that have been implemented on farms since respondents attended a workshop, and additional information required to manage their properties. The Dillman method of survey design and administration was used in construction and mailing of the questionnaire to workshop participants (Dillman 1991). In June 2013 and 2014, questionnaires were mailed to past NRE workshop participants attending events from 2011 to 2014. Respondents to questionnaires were pooled with respondents from a survey mailing conducted in 2011 to participants of workshops from 2008–2010. The survey was divided between sections with questions related to landownership, cost-share assistance program participation, types of NRE's initiated on private lands and revenues collected from new business start-ups, informational needs on land management, and respondent demographics.

RESULTS

Survey response rate was 34%, yielding an N size of 514 landowners (pooled from an estimated 30 workshops) who owned lands in 16 U.S. states. Respondents reported that they frequently utilized the NRE website (www.naturalresources.msstate.edu) to acquire information about wildlife management on their properties, business resources for establishing an NRE business, and to learn about upcoming training events. Other methods preferred by respondents for learning about NRE establishment in addition to attending workshops were watching videos (75% viewed or were interested) and using a resource binder of educational materials provided to attendees at events (65% of respondents). Resource materials sought by respondents were those about wildlife management (82%), timber management (80%), legal issues surrounding NRE operations (76%), wildlife supplemental plantings (74%), agritainment enterprises (63%), fee hunting (62%), and NRE business planning (62%).

Most workshop attendees were landowners (91%) and had the following land uses on their properties: agriculture (78%), forestry (63%), personal recreation on property (61%), fee-access recreational businesses (22%), and vegetable and mushroom production for sale (18%). In terms of landownership, respondents (n=462) owned 220 hectares on average. Land covers on properties owned were primarily forested (mean = 148 hectares/respondent), followed by agriculture (mean = 79 hectares) and other lands such as fallow fields and wetlands (mean = 41 hectares). Agricultural lands ranged from row crops (mean = 79 hectares), pasture (mean = 26 hectares), and aquaculture ponds (mean = 5 hectares). Forested lands were dominated by planted pines and bottomland hardwood forests, 74 hectares and 59 hectares on average, respectively. Mixed pine hardwood forests averaged 44 hectares, followed by upland hardwoods (mean = 39 hectares), natural pine (mean = 20 hectares) and recently harvested cutover tracts averaged 14 hectares. Other lands owned by respondents consisted of wetlands and flooded fields (averaged 10 hectares), food plots for wildlife, roads, and rights of way (each cover type averaged 8 hectares), and fishing ponds (mean = 3 hectares).

Conservation practices were implemented by respondents (n=328) on an aggregate 5,856 hectares representing on average about 50 hectares per farm. Diverse practices were reported by respondents on their properties and included mowing (56%), wildlife plantings (50%), herbicide application (43%), land disking (34%), use of prescribed fire (30%), and forest management (29%). In terms of conservation practices information requested, respondents reported wildlife plantings, herbicide application, pond management, forest thinning, and prescribed burning were the subjects most sought. Over one-half of respondents reported that they had requested assistance from university extension staffs, agency biologists, or other land management experts to implement conservation and land management practices on their properties.

Nearly one-half of respondents reported that they had lands enrolled in U.S. Farm Bill conservation cost-share assistance programs. On average, these landowners collected \$7,146 (U.S. dollars) in annual contract payments, accounting for payments in excess of \$1.25 million. Conservation Reserve Program was the most popular cost-share assistance program participated in with 97 landowners reporting enrollments of 82 hectares on average per farm. Wetlands Reserve Program had 29 farmers participating who averaged 57 hectares enrolled on average, followed by Wildlife Habitat Incentives Program with 52 participants who averaged 19 hectares enrolled and Environmental Quality Incentives Program with 49 landowners who averaged 15 hectares enrolled per farm.

One hundred and sixty-four respondents (30%) reported initiating an NRE business on their lands between 2011–2013 with 46 landowners establishing hunting leases, 40 fee-hunting operations, and 30 landowners starting fishing or agritainment operations. On average, landowners committed 329 hectares of their forests and farm lands to outdoor recreational businesses per farm, totaling over 54,000 hectares across all U.S. respondents. In terms of hunting species featured on lands, white-tailed deer (n=101) and wild turkey (n=62) were the most popular game species reported, followed by squirrel species, waterfowl, mourning dove, and rabbit. Landowners initiating NRE businesses collected on average \$13,851 per farm, totaling nearly \$2.3 million in aggregate cash flow from NRE's initiated (*Table 1*). Inferring these averages to the total number of landowners attending past workshops, an upper limit of new NRE business start-ups would equal 1,050 new NRE's established on an estimated 1.2 million hectares of forest and agricultural lands in the U.S., accounting for an aggregate cash flow of \$14.5 million U.S. dollars. Overall, respondents (69%) reported that revenues met their income expectations. When asked reasons why landowners initiated these businesses, most reported income potential from NRE operations, land conservation management, recreational potential on their lands, improving wildlife and fish on their property, and for personal hobby and enjoyment.

Lastly, most respondents did not have a business plan for their NRE and needed help in drafting such a document. To meet this need, we have initiated more advanced workshop formats to train landowners in drafting business plans to better guide their actions in starting new NRE ventures. Respondents reported that their business clients consisted of adult hunters, families, and out-of-town guests who learned about their outdoor excursions offered through word of mouth. When respondents were asked how they would prefer to learn about NRE business and land management opportunities in the future, most favored attending workshops. The majority of respondents were male (63%), older than 56 years of age, over 90% Caucasian, college graduates, and slightly more than half lived on the property reported in the survey.

Table 1: Expected income of landowner respondents from natural resource enterprises developed on their properties in the U.S. from 2008–2013.

Expected income from enterprise development	Number of responses (N=164)	Percentage (%) of total responses
\$0 – \$1,000	76	45
\$1,000 – \$10,000	47	29
\$10,001 – \$25,000	17	10
\$25,001 – \$50,000	13	8
\$50,001 – \$75,000	6	4
\$75,001 – \$100,000	1	1
\$125,001 – \$150,000	1	1
Over \$150,000	3	2

CONCLUSION

Past research has shown that private landowners earn additional revenues from their properties through fee-access outdoor recreational businesses. As a result, we have developed workshops to educate private landowners, state and federal resource agency staffs, and elected and nonelected community leaders about fee-access outdoors recreational enterprise development and integrated conservation practices on rural properties. Survey findings revealed that workshop participants have become more knowledgeable about and had implemented successful natural resource enterprises and associated land conservation management on rural properties located in U.S. states. Landowners earned income from these businesses and earnings met landowner expectations. Consequently, natural resource conservation practices conducted on private lands and associated with NRE development enhanced environmental protection on these working properties and thus, provided viable ecosystem services to rural communities in the U.S.

In terms of providing outreach programming in the U.S., multi-state stakeholder collaboration among land-grant universities, state and federal resource agencies, conservation and agricultural trade organizations, and private-sector groups has been vital to designing and implementing educational programming to attract and educate forest landowners and agricultural producers. Outreach programming promoting fee-access recreation and conservation on privately-owned U.S. lands can benefit landowners and local communities through sustainable economic development, environmental conservation, and land

stewardship and retention. It is believed that this hands-on approach of participatory teaching, marketing, and information dissemination through workshop programming is effective at delivering quality land management training to landowners in rural America who oftentimes have difficulty in acquiring knowledge and skills. In this fashion, we can assist landowners in rural landscapes to diversify family incomes on their lands while enhancing land and water conservation, thereby strengthening local economies and providing ecosystem services and quality outdoor recreation on the U.S. land base that might not otherwise be provided if incentives were not present.

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Development and Possibilities for Close-to-Nature Forest Resource Management in Hungary

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Abstract – Legal regulations of the activities of forest managers were fundamentally changed by the legislature of the past decade, and little is known about the actual change in forest management practices. Based on the data collected by the State Forest Service, this study investigates the changes of the past 15 years and presents the influencing factors, primarily the species and sectorial characteristics and differences

In the study both the area of final cuts and regenerations are presented by modes, sectors and species. The main factors influencing forest resource management are site (which can be modified by climate change) and the corresponding species or stand type. Based on these possibilities, close-to-nature forest management can be evaluated on a more realistic basis. The sum and average values for the whole country are too general; the country consists of sectors with different forest resource management properties.

forest resource management / final cutting methods / regeneration methods

Kivonat – A természetközeli erdővagyon-gazdálkodás fejlődése és lehetőségei. Az elmúlt évtized jogi előírásai és igazgatási eljárása alapvetően megváltoztatták az erdőgazdálkodók tevékenységének szabályozását, amely a gyakorlatot is módosítja, ennek mértékéről azonban nem sokat tudunk. A tanulmány az Erdészeti Igazgatóság által gyűjtött és közzétett adatok alapján mintegy 15 év változását vizsgálja és bemutatja a ható tényezőket, elsősorban a regionális és a szektorális sajátosságokat és különbségeket.

A véghasználat területét és fatérfogatót használati módonként, régióként, szektoronként és fafajonként mutatjuk be, az erdőfelújításokat (első kivitel és befejezett erdősítés) felújítási módonként, régióként, szektoronként és fafajonként szemléltetjük. A (klímaváltozással módosuló) termőhely, az annak megfelelő fafaj bizonyul az erdővagyon-gazdálkodást meghatározó legfontosabb tényezőnek, így a természetközeli erdővagyon-gazdálkodás lehetőségeit is reálisabban ítéldhetjük meg (amely a további változások megtervezésénél és előírásánál hasznos lehet). Az országos összesen és az átlagok magyarázó ereje nagyon kicsi, az ország teljesen máshogy működő erdővagyon-gazdálkodású régiókból áll, kívánatos a regionális erdővagyon-gazdálkodási programok készítése.

erdővagyon-gazdálkodás / fahasználati eljárások / erdőfelújítási módok

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1 INTRODUCTION

The law LIV of 1996 regarding forests put forest management on new foundations in the period after the change of the political system. This period was closed by the law XXXVII of 2009, also a forest law, which introduced a new attitude towards ecological sustainability of forest management.

Several studies were published about close-to-nature forest management (Solymos 2000), silviculture (Frank 2012), about the change of the structure of forest resources (Lett – Stark 2013), and about regional forest management (Lett – Stark 2014).

The initiative called „Past and Future” started as a consultation among forestry professionals on close-to-nature forest management, which then resulted in a series of publications. It started with the publication of the presentations of the Őrség Forestry Days, which deals mainly with the selection system in small forest properties in the Vend area (Lett et al. 2009). The publication was a success; it had a positive effect on the opinion of experts and the next publication „Past and Future II: from clearcut to selection system” dealt with the experience of scientists, educators, and administrators in separate chapters. The study also raised questions and listed possible failures in connection with introducing the selection system (Lett et al. 2010). The topic became even more interesting as the new Forestry Law (Law XXXVII of 2009) made the introduction of the selection system compulsory in an increasing proportion after every 10 year period in the state forests.

The gathered experience was discussed on the 2nd Meeting of Forestry Economists and the studies were published in a publication “Past and Future III – The selection system from the viewpoint of forest managers” (Lett – Schiberna 2012)

The publication “Past and Future IV – Sustainability, close-to-nature management, control by the society” was compiled based on the presentations of another conference (Forest forum in Kőszeg) (Gyöngyössi 2012).

Theoretical questions of the new method are discussed in Schiberna et al. (2012); the practical economic investigations were summarized by Csépanyi (2013). The investigations of the cost-benefit relations in transformation and selection systems (Marosi – Juhász 2012, 2014) also contributed to the general economic understanding of these systems.

The forestry law of 1996, with its ministerial decrees and regulations, completely changed the regulation of activities of forest managers, which then modified the everyday practice. Little is known about the scope of this change; therefore, we decided to make a preliminary analysis based on the data of the year 2000.

To characterize forest resource management, we present the change of utilizations and regeneration modes in the first decade of the 21st century (2000–2009/2010 and 2008/2009).

We consider year 2000 as a base so that changes can be made visible.

The combinations of utilization and regeneration modes are directly related to forest resource management concepts and are the distinctive characteristics of silvicultural regimes. This study puts emphasis on factors influencing silviculture, among which site and tree species combinations are of paramount importance. Due to the significant differences between state and private forests with regards to these factors, the prospects of close-to-nature forest management are also different in these sectors.

2 MATERIALS AND METHODS

The study is based on the primary analysis of data published annually by Forestry Authority (ÁESZ; MGSZ; Forestry Directorate of NÉBIH): Report on afforestations and utilizations in the years 2000–2010.

When analyzing forest resource management, combinations of timber utilization and regeneration modes are investigated. Forestry Authority prepared two lists about utilization–regeneration mode combinations in this period because of the changes in the legal regulation. Comparisons and data analysis were conducted with due regards to these differences.

As the basis for comparison, the year 2000 has been chosen, which is far enough from 1996 to allow time for the new regulations to take effect, and also far enough from 2009 to have a sufficient dataset to be analyzed. Of course some years bring random elements, but there are insufficient periods for calculating averages about the new forest resource management regulations, and the appearance and registration of first plantings also changes.

In this study the differences between public (state and community) and private ownership forms are also analyzed.

3 PRODUCTION, PROTECTED AND NATURA 2000 FORESTS

Because of the change in legal environment, we investigated the forest assets management in the new primary function categories.

The area of final cuttings in the production forests is double that of the protected and Natura 2000 forests (and nearly half of this area is black locust). Forest resource management (and its elements) is strongly influenced by the utilization of exploitable stands on protected and Natura 2000 areas in the next 10–20 years; the limiting regulations of their regeneration and the encouragements for species changes. One fifth of the allowable cut is black locust and poplar on the protected and Natura 2000 areas, which is another long term problem. A similar question is the role of conifers (spruce – lowland and barren lands, present situation and future vision); conifers on protected and Nature 2000 areas make up half of the area on production areas for the same species.

Because of the large difference in species proportions, the area and volume relations also show big differences among production and protected forests as shown in *Table 1*.

With the Natura 2000 designations (and with their interpretation by the authorities) the area of forest with non-production functions has practically doubled, and the proportion of stands with native species on protected/Natura2000 areas is higher than on production areas.

Besides the stock variables of forest management (forest area – FA, growing stock – GS) special attention is also given to the flow elements (area of cuttings – AC, volume of cuttings – VC). The allowable cut (final cuttings) is presented by the area and volume of stands designated for cutting in the next decade.

Another important question of Hungarian forest resource management is to what extent the allowable cut on protected and Natura2000 areas can be utilized.

Beech evokes strong emotions especially from nature conservationists and partly also from the general public. However, it is only important in smaller regions because its share in the forest cover and in the standing timber volume is low on national level. Because of the overwhelming proportion of the protection function in beech forests, the only way to make use of their timber yield is to apply close-to-nature silvicultural methods that are suitable for the protection goals.

Table 1. Forest area and growing stock in 2010, as well as area and volume of final cutting 2000–2010 by species in production, protected and Natura 2000 forests in Hungary

Species	Forest area (FA)		Area of final cutting (AC)		Growing stock (GS)		Volume of final cutting (VC)	
	Production (10 ³ ha)	Protected Natura (10 ³ ha)	Production (10 ³ ha)	Protected Natura (10 ³ ha)	Production (10 ⁶ m ³)	Protected Natura (10 ⁶ m ³)	Production (10 ³ ha)	Protected Natura (10 ³ ha)
1 Beech	22.0	88.0	2.5	6.1	8.0	31.4	1.3	3.1
2 Oak	166.2	222.0	10.0	19.0	32.1	52.0	3.5	6.5
3 Turkey oak	102.2	104.1	12.1	11.5	22.1	23.1	3.8	3.6
4 Other hardw.	80.4	120.3	8.6	10.7	13.8	22.7	2.1	2.8
5 LRHW (1+2+3+4)	370.8	534.4	33.2	47.3	76.0	129.2	12.9	19.2
6 Black locust	376.6	70.3	74.7	7.2	39.6	8.5	11.8	2.6
7 Hybrid popl.	93.1	30.7	31.8	10.0	10.9	5.0	5.0	2.1
8 Bl.l.+Hyb.popl (6+7)	469.7	101.0	106.5	17.2	50.5	13.5	16.8	4.7
9 Poplars	46.3	27.2	8.1	4.7	6.6	5.9	1.9	1.6
10 Other softw.	43.8	56.0	6.6	8.2	9.4	13.8	1.9	1.3
11 Conifers	141.5	71.4	14.8	6.5	34.0	20.1	4.0	2.1
12 Softw.+con. (9+10+11)	231.6	154.6	29.5	19.4	50.0	39.8	7.8	5.0
13 Non LRHW (8+12)	701.3	255.6	136.0	36.6	100.5	53.3	24.6	9.7
Total (5+12)	1,072.1	789.9	169.3	84.0	176.5	182.5	35.2	25.5

Legend: LRHW= long rotation hardwood

Source of data MgSzH

In the cases of black locust and hybrid poplar, more than 100 thousand hectares are under protection or Natura2000. Of course these forests are not the subject of protection, but they fall within protection zones. However, protection measures also affect them. These two species make up a considerable share in harvest volume and, thus, they also have a great financial impact on the forestry sector. It is difficult to measure how far they fall from close-to-nature state, and it is even more difficult to find ways through which close-to-nature silvicultural methods could be introduced in these plantations without the plantations losing their profitability. The attitude of nature protection is basically condemnatory and the problems can be handled on a very long time frame.

The proportion of coniferous stands has considerably diminished. Their state of health is critical; it is possible and necessary to replace these stands with other species.

There is a critical situation in the groups of oak, Turkey oak and other hardwoods where the proportion of production forests exceeds one-third and approaches one-half.

4 FINAL CUTTING AND REGENERATION MODES

4.1 Area and volume of final cuttings by sector and cutting modes

The combinations of final cutting and regeneration modes characterize forest resource management. Firstly, the data on final cuttings (and those of regeneration, which are nearly identical) is presented. Dataset is classified by sector (state and private) and modes of cut (clearcut and regeneration cut).

At the flow data and especially at the area of final cuts (*Table 2*), but also at volume (*Table 3*) the possibilities of private forestry are considerable, particularly in black locust and hybrid poplar stands.

Table 2. Area of final cuttings 2000 – 2010 (ha)

Sector	Clear-cut	Regen. cut	Shelt. cut	Final cut total	(Sel. cut)	(Stock maint.)	Unr. cut	Oth.	Total	Clear cut %
2000										
State + community	8,211	3,465	–	11,676	*	*	108		11,785	69.7
Private	8,823	534	–	9,358	*	*	35		9,392	93.9
Total	17,034	3,999	–	21,034	*	*	144		21,177	80.4
(%)	80.4	18.9	–	99.3	*	*	0.7		100	
2010										
State + community	7,780	3,342	241	11,363	*	*	449		11,812	65.9
Private	9,356	792	41	10,188	*	*	48		10,236	91.4
Total	17,216	4,134	285	21,635	*	*	499		22,134	77.8
(%)	77.8	18.7	1.3	97.7	*	*	2.3		100.0	

* Authorities do not assign area for regeneration obligation.

Source of data MgSzH

Table 3. Volume of final cuttings by modes of cut and sectors 2000 – 2010 (10³ m³)

Sector	Clear-cut	Regen. cut	Shelt. cut	Final cut total	(Sel. cut)	(Stock maint.)	Unr. cut	Oth.	Total	Clear cut %
2000										
State + community	2,017	1,252	–	3,269	–	–	322	39	3,630	55.6
Private	1,627	125	–	1,752	–	–	104	22	1,878	86.6
Total	3,644	1,377	–	5,021	–	–	426	61	5,508	66.2
(%)	66.1	25.0	–	91.1	–	–	7.8	1.1	100	
2010										
State + community	1,801	1,209	95	3,107	41	1	456	31	3,635	49.5
Private	1,813	2,370	12	2,062	4	5	99	18	2,187	82.9
Total	3,629	1,447	107	5,184	45	6	556	49	5,841	62.1
(%)	62	24.8	1.8	88.8	0.8	0.1	9.5	0.8	100	

Source of data MgSzH

Cutting modes in 2010 were extended with modes which were not present in the statistics in 2000 (shelterwood cut, selection cut, growing stock maintaining cut). In the statistics of 2010, the new elements of utilization, the volume of which is minimal, appeared. Shelterwood cut generates obligation for regeneration; for selection cut and growing stock maintaining cut – the volume of which is negligible – the authorities do not assign obligation for regeneration.

The basic consequence is the change of proportion of clearcuts which is similar in terms of area and volume, but is different in magnitude (because of the already mentioned difference in specific volume). Regeneration cuts did not increase considerably in volume or in proportion; shelterwood cut, selection cut, and growing stock maintaining cuts just appeared recently and are in the phase of planning. The numbers of utilization (and consequently those of regeneration) show a steadiness typical for sustainable management and we cannot expect a sudden change in volume because of the strong determination.

4.2 Volume of final cuttings 2000–2010

Comparing the data from 2000 and 2010, no considerable shift in area, volume, proportions, or sectors can be observed, but a little change is noticeable from clearcut to regeneration cut (regeneration cut also increased in private sector). Clearcut is still determining in private forestry. *Figure 1* shows the proportions, their differences, and change in time.

The difference between the sectors in final cut – regeneration modes is considerable because of the stable difference in the forest resource of the state and private sector; changing this is a slow process determined by many other factors.

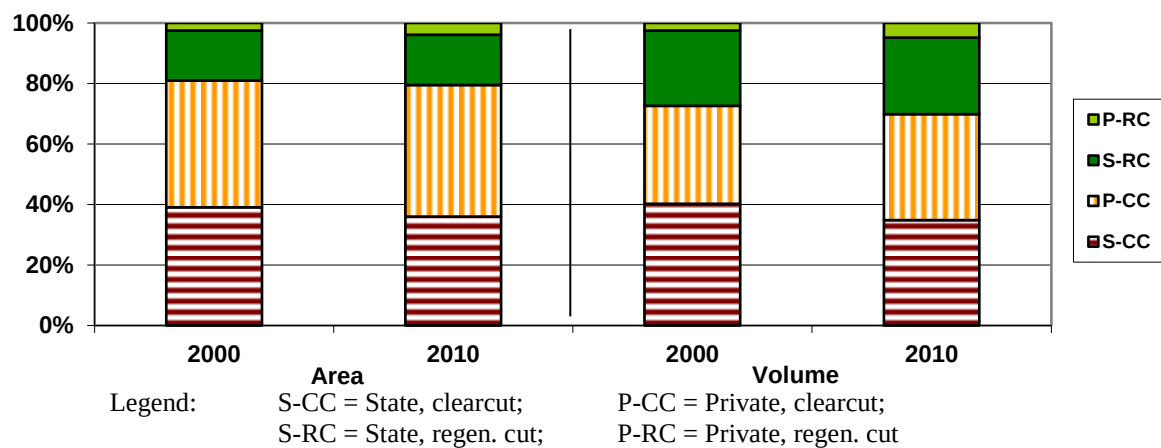


Figure 1: Distribution of final cuts by modes and sectors 2000–2010 (Source of data MgSzH)

4.3 Volume of final cutting by species and sectors

In 2000 the statistics of final cuts by species provided the volumes as total, not divided by clearcuts and regeneration cuts, so the table was completely different. The data in *Table 4* show the differences between the sectors by species.

Table 4. Volume of final cuts by species and sectors 2010

Species	Clearcut		Regen. cut		Shelterw. cut		Total final cut	
Total	(10 ³ m ³)	(%)	(10 ³ m ³)	(%)	(10 ³ m ³)	(%)	(10 ³ m ³)	(%)
1 Beech	22.4	0.4	428.6	8.3	49.4	1.0	500.3	14.7
2 Oak	344.7	5.9	392.2	6.7	23.0	0.4	760.0	13.3
3 Turkey oak	209.2	3.6	463.6	7.9	14.6	0.3	687.4	3.0
4 Hornbeam	71.5	1.2	78.6	1.3	6.9	0.1	157.0	2.4
5 Other hardwoods	101.2	1.7	20.5	0.4	4.4	–	126.2	43.0
6 LRHW (1+2+3+4+5)	749.0	14.4	1,353.5	26.1	98.3	1.9	2,230.9	25.6
7 Black locust	1,317.4	22.6	6.3	0.1	1.3	–	1,325.0	15.5
8 Hybrid poplar	805.8	13.8	0	–	–	–	805.9	41.1
9 Black l. + hyb. popl.	2,123.2	41.0	6.3	0.1	1.3	–	2,130.9	2.4
10 Poplar	124.8	2.1	2.0	0	0.2	–	127.0	0.6
11 Willow	31.6	0.5	–	–	–	–	31.6	2.8
12 Other softwood	123.4	2.1	20.3	0.3	2.4	0.1	146.1	10.0
13 Conifers	477.2	8.2	34.9	0.6	5.6	0.1	517.7	15.9
14 Other sw and con. (10+11+12+13)	757.0	14.6	57.2	1.1	8.2	0.2	822.4	57.0
15 Non LRHW (9+14)	2,880.2	55.6	63.5	1.2	9.5	0.2	2,953.3	14.7
Total	(10 ³ m ³)							
	3,629.2		1,447.0		107.9		5,184.1	
	(%)	70.0		27.9		2.1		100

Legend: LRHW= long rotation hardwood

Source of data MgSzH

Table 4 continued. Volume of final cuttings by species 2010

Species	Clearcut		Regen. cut		Shelterw. cut		Total final cut	
State	(10 ³ m ³)	(%)	(10 ³ m ³)	(%)	(10 ³ m ³)	(%)	(10 ³ m ³)	(%)
1 Beech	16.1	0.5	368.6	11.9	47.1	1.5	431.8	13.9
2 Oak	274.4	8.8	336.3	10.8	20.5	0.7	631.3	20.3
3 Turkey oak	164.8	5.3	378.5	12.2	13.3	0.4	556.6	17.9
4 Hornbeam	46.8	1.5	57.2	1.8	5.2	0.2	109.2	3.5
5 Other hardwoods	68.0	2.2	17.2	0.6	4.0	0.1	89.2	2.9
6 LRHW (1+2+3+4+5)	570.	18.4	1,157.8	37.3	90.1	2.9	1,818.1	58.5
	(%) 31.4		63.7		4.9		100	
7 Black locust	410.8	13.2	2.0	0.1	0.3	–	413.1	13.3
8 Hybrid poplar	323.5	10.4	–	–	–	–	323.5	10.4
9 Black l. + hyb.popl.	734.3	23.6	2.0	0.1	0.3		736.6	23.7
10 Poplar	67.8	2.2	1.8	0.0	0.2	0.0	69.8	2.2
11 Willow	18.5	0.6	–	–	–	–	18.5	0.6
12 Other softwood	42.3	1.4	19.7	0.6	2.4	0.1	64.4	2.1
13 Conifers	368.3	12.4	28.5	0.9	2.4	0.1	399.1	12.8
14 Other sw and con.	496.9	16.0	50.0	1.5	5.0	0.2	551.8	17.8
15 Non LRHW (9+14)	1,231.2	39.6	52.0	1.6	5.3	0.2	1,288.4	41.5
	(%) 95.6		4.0		0.4		100	
Total	(10 ³ m ³) 1,801.3		1,209.8		95.4		3,106.5	100
	(%)	58.0		38.9		3.1	100	
Private								
1 Beech	6.3	0.3	59.9	2.7	2.3	0.1	68.5	3.3
2 Oak	70.3	3.2	55.7	2.5	2.4	0.1	128.4	6.2
3 Turkey oak	43.4	2.0	85.0	3.9	1.2	0.1	129.6	6.3
4 Hornbeam	24.6	1.1	21.4	1.0	1.5	0.1	47.5	2.3
5 Other hardwoods	33.1	1.5	3.3	0.2	0.2	–	36.6	1.8
6 LRHW (1+2+3+4+5)	177.7	8.6	225.3	10.9	7.6	0.4	410.6	19.9
	(%) 43.3		54.9		1.8		100	
7 Black locust	901.3	43.7	4.3	10.1	0.9	–	906.5	44.0
8 Hybrid poplar	477.6	23.1	–	–	–	–	477.6	23.1
9 Black l. + hyb.popl.	1,378.9	66.9	4.3	10.1	0.9	–	1,384.1	67.1
10 Poplar	56.6	2.6	0.3	–	–	–	56.9	2.8
11 Willow	12.9	0.6	–	–	–	–	12.9	0.6
12 Other softwood	80.2	3.7	0.6	–	0.1	–	80.8	3.9
13 Conifers	107.0	6.9	6.5	0.3	3.2	0.1	116.7	5.7
14 Other sw and con.	256.7	12.4	7.4	0.3	3.3	0.1	267.3	13.0
15 Non LRHW (9+14)	1,635.6	79.3	11.7	0.6	4.2	0.2	1,651.4	80.1
	(%) 99.0		0.7		0.3		100	
Total	(10 ³ m ³) 1,813.4		236.9		11.7		2,062.0	
	(%)	87.9		11.5		0.6	100	

Legend: LRHW= long rotation hardwood

Source of data MgSzH

The proportion of clear cut in state and private forests are nearly similar in area and volume, but the species distribution and, therefore, the management conditions are substantially different. In private forestry, the role of black locust is vast and the role of hybrid poplars is also important.

The majority of final cuttings in state forestry consist of broadleaved hardwood stands (58.5%). In these stands clearcut does not reach one third of the area (in the case of beech not even 5%), while in other species this proportion is 95%.

In private forestry the share of broadleaved hardwoods is only one fifth, and black locust (44%) and hybrid poplar (23%) are in majority. With other species clearcut is nearly 99%, while in the case of broadleaved hardwoods the situation is similar to that in state forests.

Using clearcut or regeneration cut depends mainly on species, but other factors and stand characteristics can also influence the decision.

Behind the differences in final cutting – regeneration modes between sectors (*Figure 2*) are the differences in species, so the differentiation is for the long run. In the species composition of regeneration cuts, the difference is much smaller (beech is important in state forests) and in clearcut, oak is important in state forests.

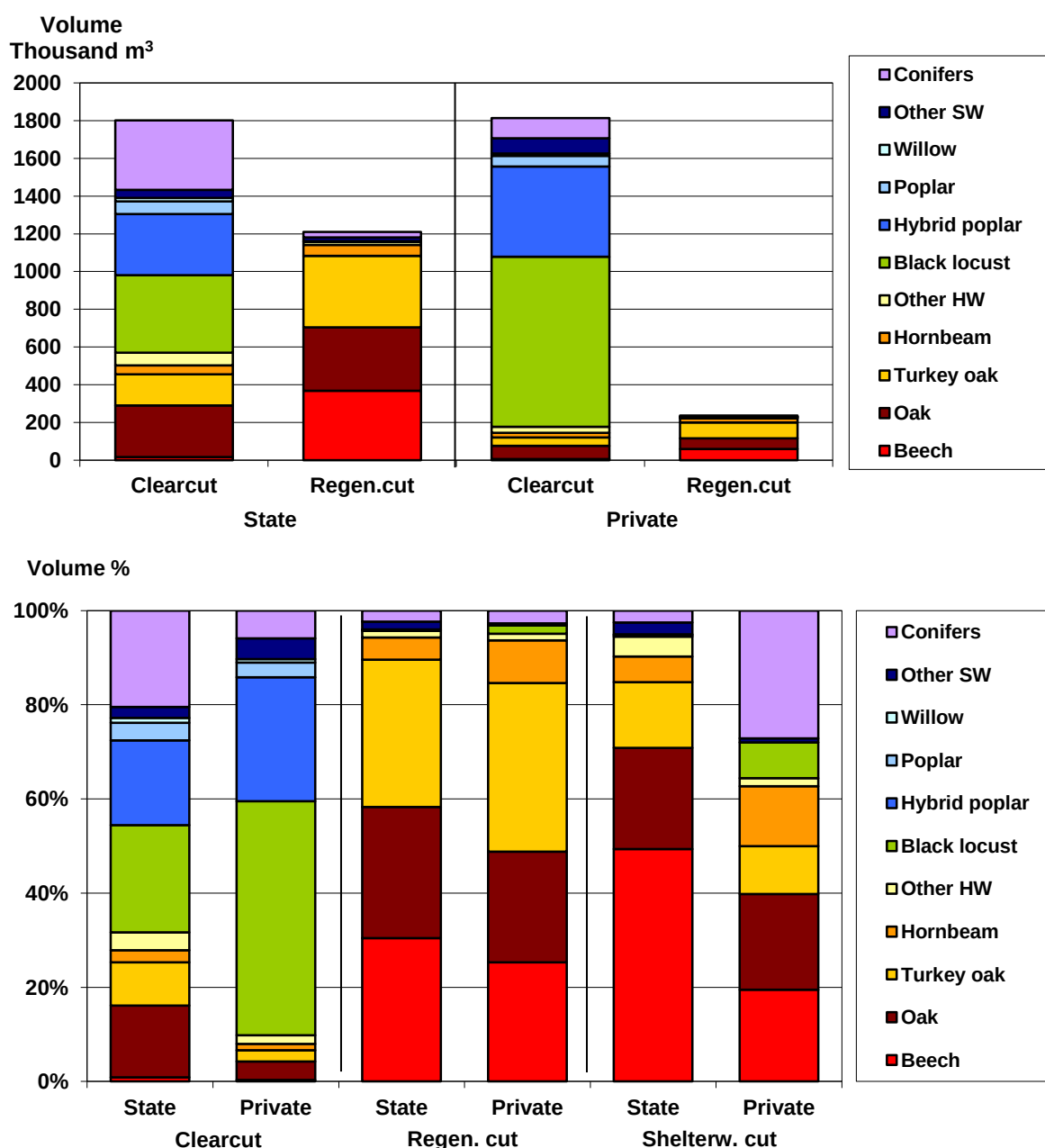


Figure 2. Comparison of state and private forest resource management
(Source of data MgSzH)

Based on the data in *Table 4* and *Figure 3*, the following statements can be made:

- proportion of regeneration cuts in turkey oak is higher than in oak (similarly to beech) in both sectors
- regeneration cuts are negligible in short rotation stands and no increase is expected

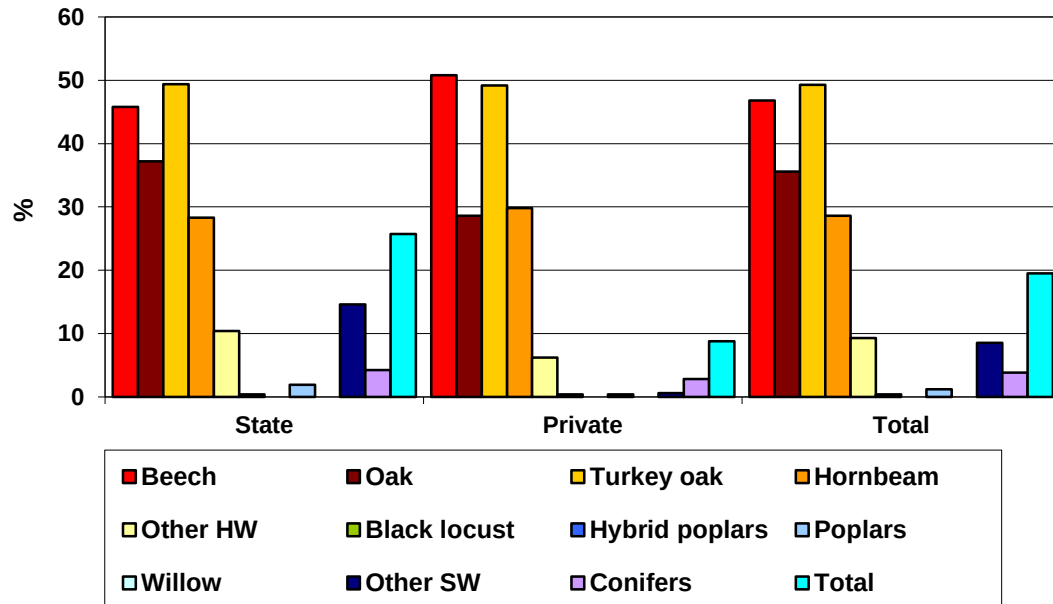


Figure 3: Proportions of regeneration cuts (2010) (Source of data MgSzH)

Annual final cuttings have stabilized, the changes do not have a tendency, the increase of conifers is steady, and a decrease is expected with hybrid poplars (Figure 4)

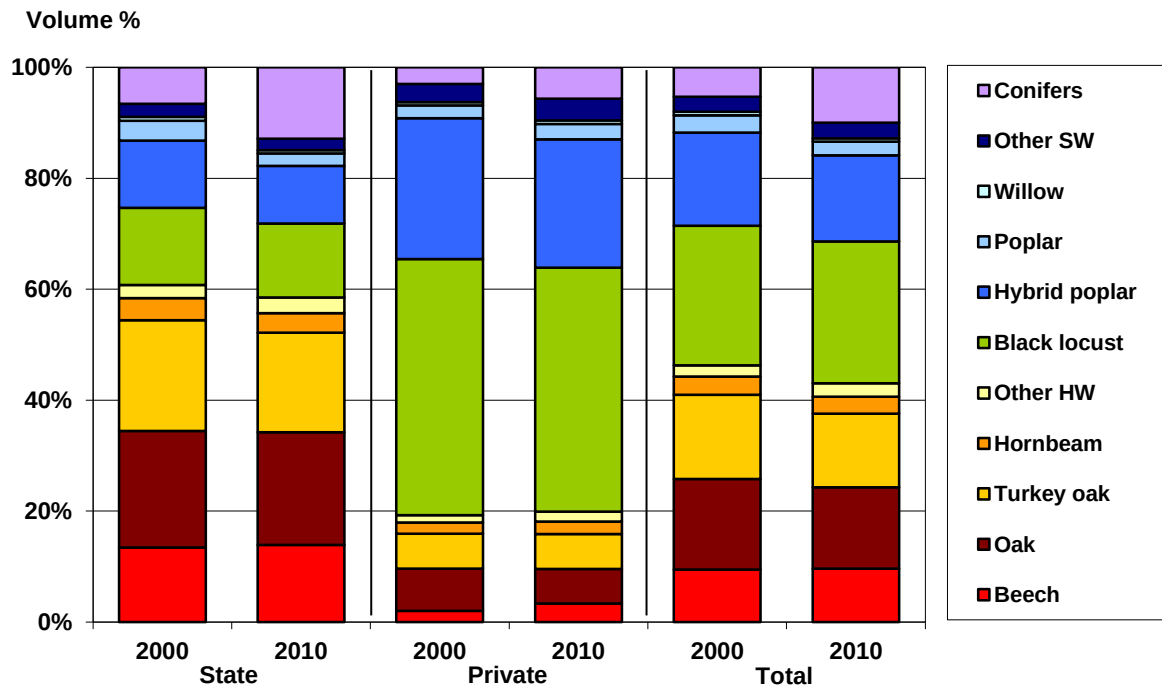


Figure 4. Change of final cutting by species (2000–2010) (Source of data MgSzH)

According to proportion of final cut, species groups with good separation can be observed (*Table 5*) and rotation age is an important influencing factor:

- below 55%, conifers because of the age structure
- between 55–70%, native stands with high rotation age (but also other softwood in the state forest category)
- final cut proportion is over 70% in the case of short rotation age
- with some species the final cut proportion is lower in the state forest than in private forest, the rotation age is higher,
- there is no substantial change in time because of the stable species structure, only slow change is to be expected,
- the final cut proportion is two-thirds in the state forest, and about three-quarters in the private forest

Table 5. Proportion of final cut volume within total timber removal in 2000 and in 2010 (%)

Species	State		Private		Total	
	2000	2010	2000	2010	2000	2010
Beech	70.1	53.7	62.1	58.1	69.4	54.6
Oak	69.7	69.7	67.5	65.9	69.3	69.0
Turkey oak	76.0	72.7	57.8	75.1	75.9	73.2
Hornbeam	47.3	54.0	56.8	66.2	49.1	57.2
Other HW	53.8	54.2	66.3	68.5	56.3	57.5
Black locust	79.9	78.3	87.1	82.9	84.4	81.4
Hybrid poplar	78.2	81.4	79.3	82.7	78.8	82.2
Poplar	60.4	73.9	71.1	75.7	76.6	74.1
Willow	47.1	70.3	61.1	79.6	60.7	74.2
Other SW	51.5	47.6	68.8	78.1	57.7	60.9
Conifers	33.6	58.7	26.2	51.2	31.8	56.9
Total	66.1	66.1	74.7	76.4	68.9	69.8

Source of data MgSzH

5 PERFORMANCE AND CHANGE OF COMPOSITION OF REFORESTATION

5.1 Mode and performance of reforestation (2000–2009)

The forest resource management of the 2000's was determined by financing along similar principles, but with different practices: funds for supporting forest resource and normative financing of regeneration. The effects if its termination in 2008 will be detectable only after several years have passed.

The proportion of regeneration cut has not reached one-fifth in the state-owned forests, and within this artificial regeneration there is more regeneration than natural seed origin in clearcuts. In private forestry, natural regeneration can be applied only to some species, but black locust coppice regeneration reduces artificial regeneration, thus reducing costs for the forest manager (*Table 6, Figure 5*).

In the forest resource management of the state-owned forest, use of regeneration cut has exceeded one-quarter (we will get back to this when species distribution is discussed). There is still more artificial regeneration in regeneration cuts (with its high costs) than seed origin in clearcuts.

The first plantings in 2000 and the completed reforestations in 2008/2009 can be compared; regeneration cuts slightly decreased, artificial regenerations and coppice regenerations increased at the expense of natural seed regeneration.

In the vegetation year 2008/2009, there is no considerable change in the area and proportions of regeneration cuts, perhaps the natural seed regeneration increased in private forestry.

Table 6. Regeneration – First planting (2009) (ha)

Mode of regeneration	State			Private			Total		
	CC	RC	Total	CC	RC	Total	CC	RC	Total
Natural seed	63	2,920	2,984	95	726	821	158	3,646	3,804
Natural Coppice	2,027	–	2,027	4,309	–	4,308	6,336	–	6,336
Artificial	4,916	83	4,999	3,624	7	3,631	8,540	90	8,630
Total	7,007	3,003	10,010	8,028	733	8,761	15,034	3,736	18,770
Additional plant.	1,939	918	2,857	677	45	722	2,630	964	3,594

Legend: CC = clearcut; RC = regeneration cut;

Source of data MgSzH

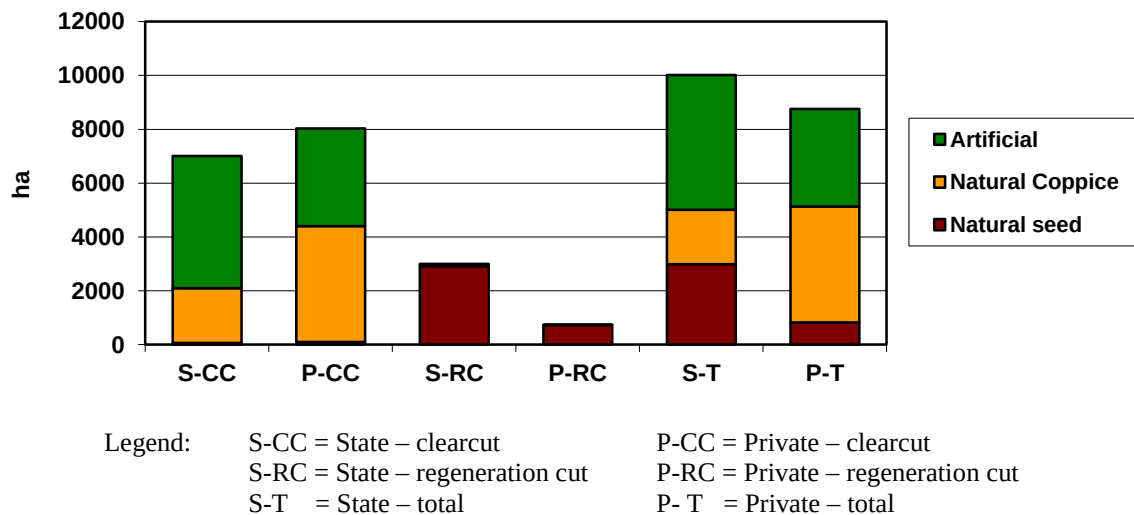


Figure 5. Final cuttings – reforestation first planting by sector (2009)

Annual replacements of plants are attached to the first plantings, though there are no data available on the distribution of species or on the mode of regeneration.

We will investigate the data of the afforestation for the last year in more detail. The combination of clearcut and natural regeneration from seed hardly occurs, and artificial regeneration and regeneration is also rare (regeneration cut and coppice regeneration does not occur at all). There are considerable differences between state and private management in terms of cutting and regeneration modes:

The proportion of natural regeneration from seeds does not reach 20% proportion and is mainly concentrated in state forests. One-third of the regenerations are done naturally, but from coppice (the distribution of the coppice regenerations by age and species needs a separate investigation because of the still existing old stands).

Nearly half of the regenerations are artificial regeneration after clearcut.

There is a considerable difference between sectors in regeneration after clearcut. In the case of state forests, two-thirds are regenerated artificially, while in private forests the proportion of natural coppice is higher. In the case of regeneration cuts, natural seed regeneration is dominant.

5.2 Comparison of regenerations by species and sector

The previous chapter presented the relation of utilization and regeneration and the differences in sectors. These sectorial differences can be explained by the difference of species of regeneration. Clearcut is dominant in private forestry (and within this, mainly black locust and less hybrid poplar) and regeneration cut is marginal. On the species level, there is little difference between sectors in the utilization and regeneration modes. (Table 7 and Figure 6)

Table 7. Regeneration and first planting by species (2010) (ha)

Species	Clearcut		Regeneration cut		Total	
	State	Private	State	Private	State	Private
Beech	75	13	945	191	1,020	204
Oak	1,571	660	970	260	2,541	920
Turkey oak – other hw.	755	286	1,053	281	1,808	567
LRHW	2,401	959	2,968	732	5,369	1,691
Black locust	2,065	4,748	–	–	2,065	4,748
Hybrid poplar	681	1,306	1	–	682	1,306
Other softwood	1,231	889	–	–	1,232	889
Conifers	629	127	34	1	663	128
Non LRHW	4,606	7,070	35	1	4,641	7,071
Total	7,007	8,029	3,003	733	10,010	8,762

Legend: LRHW= long rotation hardwood

Source of data MgSzH

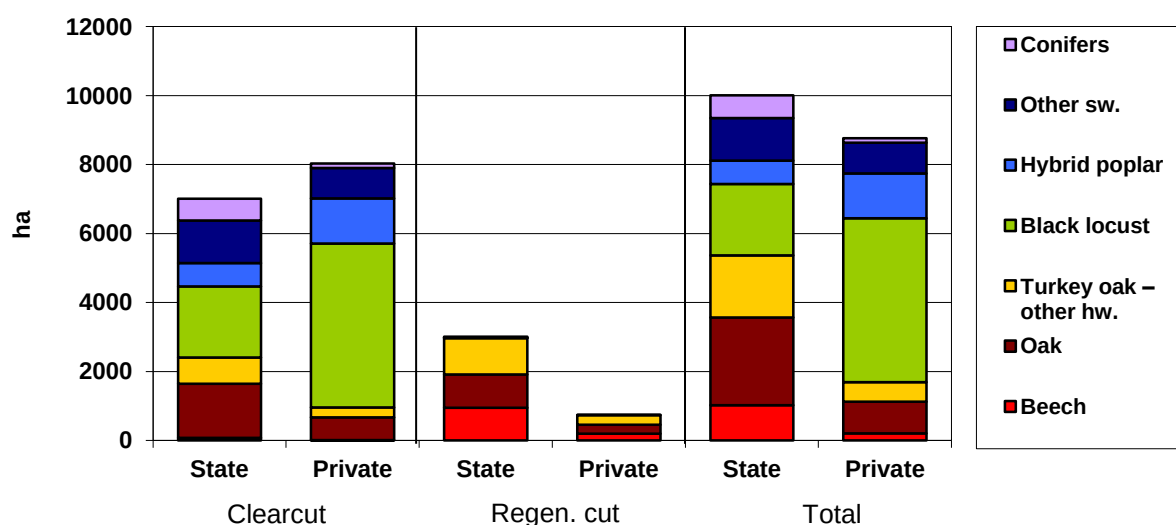


Figure 6. First planting of regenerations by species (2010) (Source of data MgSzH)

5.3 Change of regeneration modes and performance

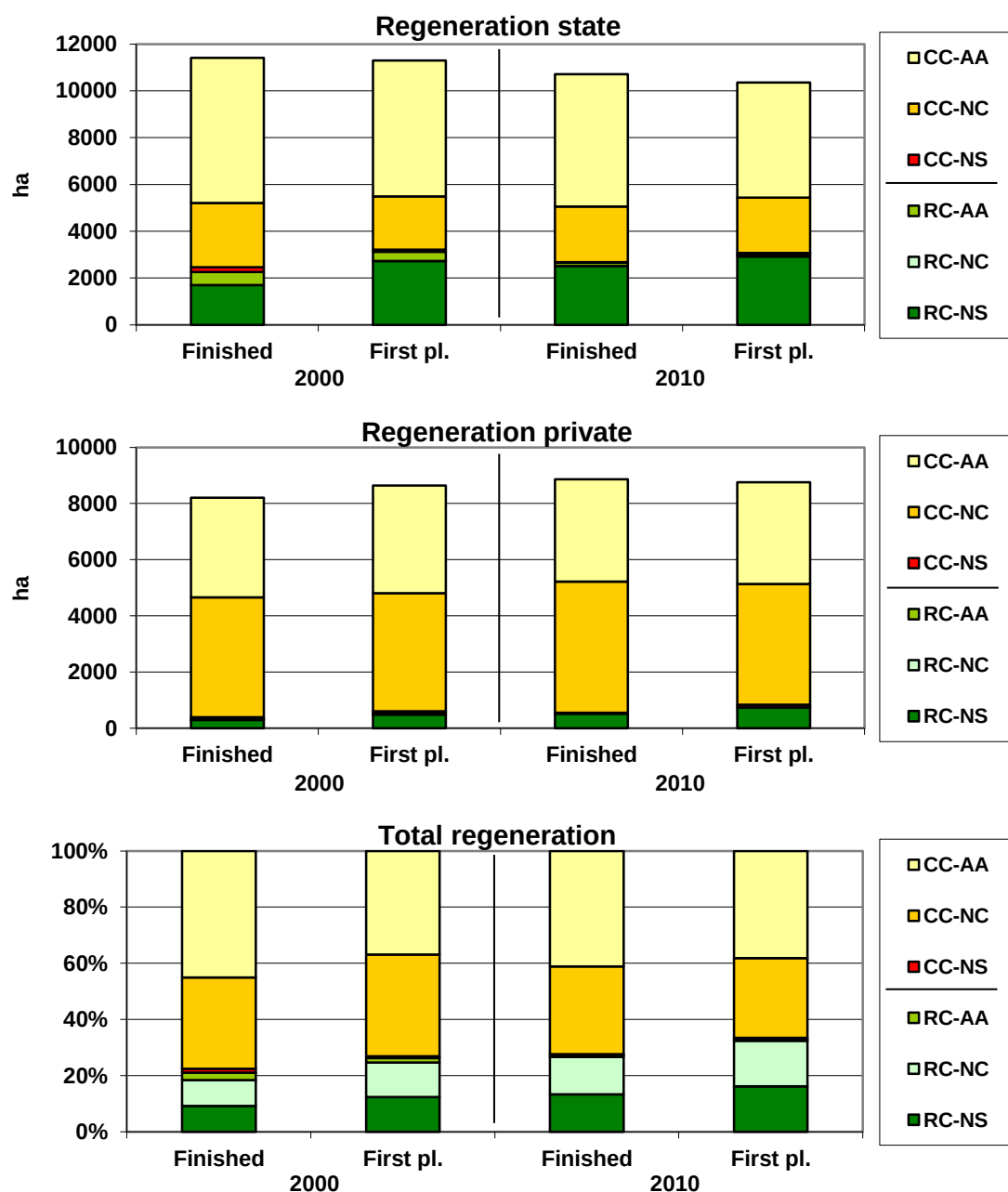
Taking into consideration the two dates of finished regenerations and first plantings (2000, 2010), four series of data can be used to investigate an approximate time period of fifteen years. The distribution of regeneration cut – clearcut comes from final cuttings, and to these three regeneration modes can be assigned: natural regeneration from seeds, and coppice, and artificial regeneration. The distribution of cutting modes (clearcut and regeneration cut) and regeneration modes (natural seed, natural coppice, artificial) by sectors is presented in Table 8 and Figure 7. The species composition and its change show the difference between management in the sectors.

Table 8. Change regeneration mode and performance

Final cut and regeneration mode	State (ha)				Private (ha)			
	2000		2010		2000		2010	
	Finished	First plant.	–	First plant.	Finished	First plant.	Finished	First plant.
Regen. cut								
NRS	1,701	2,729	2,515	2,920	287	487	516	726
NRC	–	1	–	–	3	3	–	–
NR	1,701	2,730	2,515	2,920	290	490	516	726
AA	550	389	130	83	21	40	5	7
Total	2,251	3,119	2,645	3,003	311	530	521	733
Clearcut								
NRS	204	95	36	63	76	71	29	95
NRC	2,755	2,268	2,373	2,373	4,273	4,204	4,668	4,309
NR	2,959	2,363	2,409	2,436	4,349	7,275	4,697	4,404
AA	6,197	5,814	5,664	4,916	3,542	3,836	3,645	3,624
Total	9,156	8,177	8,073	9,788	7,891	8,111	8,312	8,028
Total	11,407	11,296	10,718	12,791	8,202	8,641	8,863	8,761
T-NR	4,660	5,093	4,924	5,356	4,639	4,765	3,213	5,129
T-AR	6,747	6,203	5,794	4,999	3,563	3,876	3,650	3,631
Total								
Final cut and regeneration mode	Area (ha)				Proportion (%)			
	2000		2010		2000		2010	
	Finished	First plant.	Finished	First plant.	Finished	First plant.	Finished	First plant.
Regen. cut								
NRS	1,988	3,216	3,030	3,647	10.1	16.1	15.4	19.3
NRC	3	4	–	–	–	0	–	–
NR	1,991				10.1	16.1	15.4	19.3
AA	571	429	135	90	2.9	2.2	0.7	0.5
Total	2,562	3,649	3,166	3,737	13.1	18.3	16.1	19.8
Clearcut								
NRS	280	166	65	159	1.4	0.8	0.3	0.8
NRC	7,028	9,472	7,091	6,412	35.8	47.5	36.1	33.9
NR	2,308	9,638	7,156	6,571	37.2	48.3	36.4	44.7
AA	9,739	9,650	9,345	8,597	49.7	48.4	47.5	45.5
Total	17,047	16,288	16,500	15,168	86.9	81.7	83.9	80.2
Total	19,609	19,937	19,666	18,905	100	100	100	100
T-NR	9,299	9,858	10,186	10,217	47.4	49.5	51.8	54.0
T-AR	10,310	10,079	9,480	8,688	52.6	50.5	48.2	46.0

Legend: NRS – Natural regeneration seed
 NRC – Natural regeneration coppice
 NR – Natural regeneration
 AA – Artificial afforestation
 T-NR – Total natural regeneration
 T-AR – Total artificial regeneration

Source of data MgSzH



CC = Clearcut; RC = Regeneration cut
 NS = Natural seed; NC= Natural coppice; AA = artificial afforestation

Figure 7. Change of mode and performance of regeneration in state and private sector
 (Source of data MgSzH)

5.4. Change of species composition in regeneration

The difference between modes of cut and regeneration method combinations is primarily defined by the species conditions (and site differences determining these conditions, Table 9, Figure 8).

With the species black locust, poplar, and conifers clearcut is dominant as the final cutting mode, and as regeneration, natural coppice is typical for black locust; otherwise, artificial regeneration with plants is usual. Different proportions of regeneration cuts (natural regeneration with seeds) by species can be mentioned with broadleaved hardwoods with a long rotation age, where the difference between sectors is smaller and the change is more evident in the first plantings (thus appearing in planning).

Table 9. Change in species structure of regeneration

Species	State (ha)				Private (ha)			
	2000		2010		2000		2010	
	Finished	First plant.	Finished	First plant.	Finished	First plant.	Finished	First plant.
Regen. cut								
Beech	628	955	642	945	60	84	110	191
Oak	714	995	797	970	77	169	145	260
Turkey oak - OHW	897	1,156	1,199	1,053	163	270	262	281
LRHW	2,239	3,106	2,638	2,968	300	523	517	732
Total	2,251	3,119	2,645	3,003	311	530	521	778
Clearcut								
Beech	120	109	56	75	14	21	10	13
Oak	1,736	1,841	1,919	1,571	381	643	677	660
Turkey oak - OHW	1,104	937	811	754	349	293	303	286
LRHW	2,960	2,877	2,786	2,400	744	957	990	959
Black locust	3,156	2,706	2,589	2,065	4,600	4,495	5,241	4,748
Hybrid poplar	1,312	1,099	973	681	1,674	1,851	1,320	1,306
Poplar	759	924	1,224	1,231	545	634	666	889
Conifers	927	564	502	628	268	156	123	127
Total	9,156	8,177	8,073	7,007	7,891	8,111	8,342	8,705
Total	11,407	11,296	10,718	10,010	8,202	8,641	8,863	9,483
Total								
Species	Area (ha)				Proportion (%)			
	2000		2010		2000		2010	
	Finished	First plant.	Finished	First plant.	Finished	First plant.	Finished	First plant.
Regen. cut								
Beech	688	1,039	753	1,137	3.5	5.2	3.8	6.0
Oak	791	1,164	942	1,231	4.0	5.8	4.8	6.5
Turkey oak - OHW	1,060	1,426	1,462	1,335	5.4	7.2	7.4	7.1
HVFK	2,539	3,629	3,157	3,703	12.9	18.2	16.0	19.6
Total	2,562	3,649	3,166	3,737	13.1	18.3	16.1	19.8
Clearcut								
Beech	134	130	65	88	0.7	0.7	0.3	0.5
Oak	2,117	2,484	2,596	2,243	10.8	12.5	13.2	11.9
Turkey oak - OHW	1,453	1,220	1,115	1,045	7.4	6.1	5.7	5.5
LRHW	3,704	3,834	3,776	3,376	18.9	19.2	18.9	17.9
Black locust	7,756	7,201	7,883	6,901	39.6	36.1	40.1	36.5
Hybrid poplar	2,986	2,950	2,323	2,007	15.2	14.8	11.8	10.6
Poplar	1,304	1,558	1,891	2,127	6.7	7.8	9.6	11.3
Conifers	1,195	720	626	754	6.1	3.	3.1	4.0
Total	17,047	16,288	16,500	15,168	86.9	81.7	83.9	80.2
Total	19,609	19,937	19,666	18,905	100	100	100	100
Total hardwood	6,243	7,463	6,933	7,079				

Legend: OHW = other hardwoods
LRHW = hardwoods with long rotation age

Source of data MgSzH

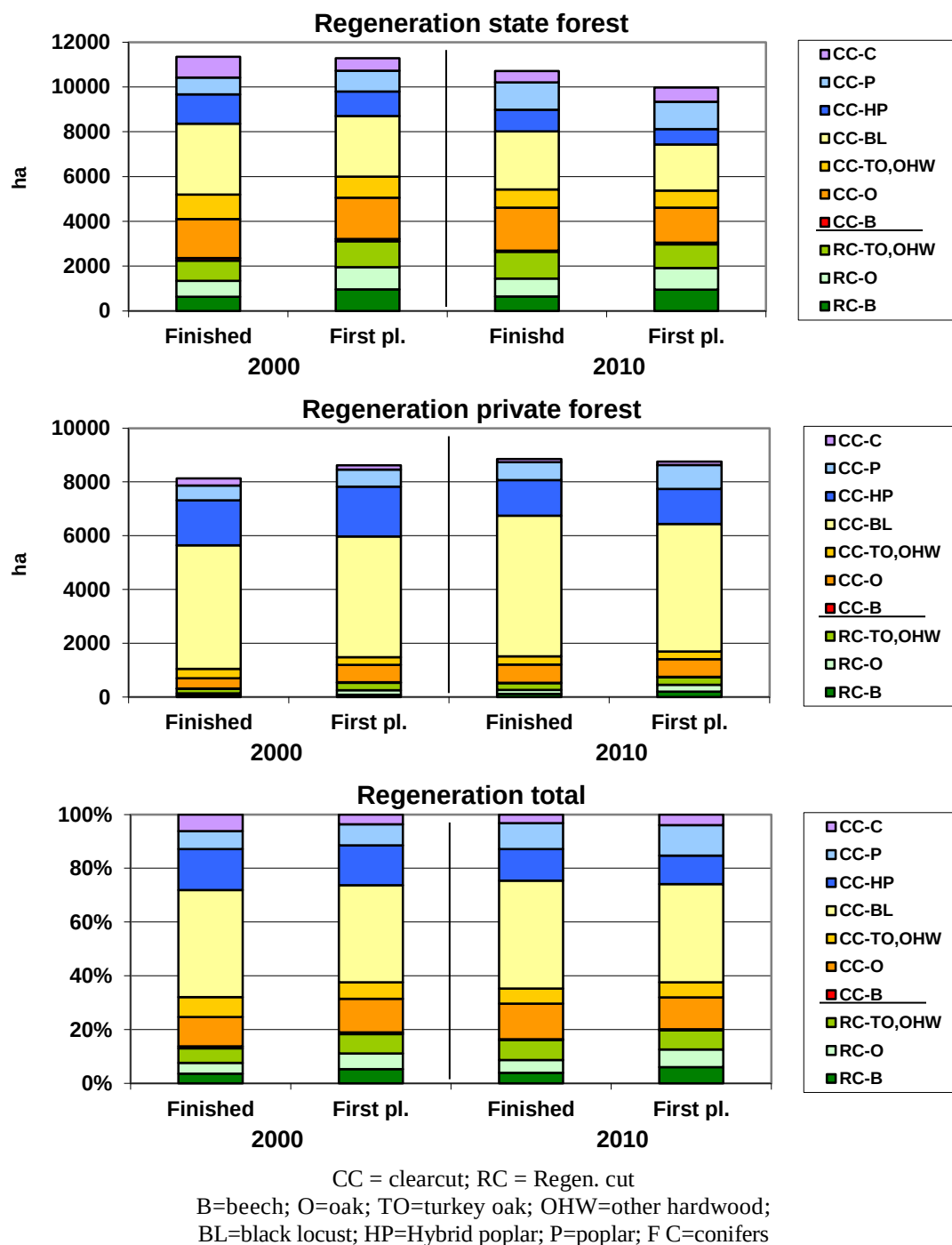


Figure 8. Change of species structure in regenerations (Source of data MgSzH)

6 SUMMARY

The modification of forest management regulations changes the practice of forest management fundamentally. The changes in legal regulation, including the ratification of the forest law in 1996, facilitated the increase of protected areas, which was followed by the designation of NATURA 2000 sites by the middle of 2000s. This process was coupled with a considerable social pressure represented by NGOs to widen protection functions of forests and to apply close-to-nature silviculture. As a result, forest management had to face increasing restrictions on forest operations limiting available technology, the time frame of fellings, and also the allowable cut.

Also, within the forestry community the idea and the new possibilities of close-to-nature methods found supporters. In regions where protection measures prohibited timber harvest completely using clear cut or short period regeneration cuttings, close-to-nature silviculture provided the only way to utilize timber yield. In other cases, forest regeneration with natural regeneration methods resulted in cost reduction.

This process reached another milestone in 2010, when a completely new forestry law was ratified introducing a classification of forests according to their natural state, a more – but not perfectly – accurate regulation of the selection system and other silvicultural methods, and also measures for the state forests on the application of these redefined methods.

This analysis attempted to describe the above process by quantifying the changes with statistical data on timber harvest and forest regeneration in the period of 2000–2010. Findings of this article reveal that:

- Forest resource management cannot apply universal concepts for the whole country; smaller regions should be designated with regulations suitable for the local specific conditions.
- Changes in the application of new silvicultural methods require long period of time
 - Any large-scale changes in silvicultural methods first shall appear in forest management plans, which have a 10 year cycle. Changes in forestry practice can, therefore, be only gradual.
 - New or rarely used silvicultural methods are often handicapped by initial skepticism and resistance. Research, field experiments, active dissemination of information, and participatory processes are prerequisites for successful introduction of new methods, all of which is time consuming.
- First signs of changes could be observed in broadleaved hardwood forests with long rotation age, where natural forest regeneration started to increase.
- Beech tends to be suitable for natural regeneration and selection systems, as these methods have the highest share in beech stands.
- Black locust and hybrid poplars are plantations, and close-to-nature silvicultural methods cannot be applied in these stands without losing their goals of production and their profitability.
- Black locust and hybrid poplars have a large share in forest areas, which limits the propagation of close-to-nature silvicultural methods.
- Forest characteristics, especially species distribution in the private and the public (state and community) sector are significantly different, which is reflected in the application of close-to-nature silvicultural methods.
- Within the same species categories, private and public sectors show minor differences. In the case of beech, private forestry shows higher (but still low) level of clearcuts, while in the case of oak and turkey oak, close-to-nature silviculture is more common in the private sector than in the state sector.

The application of close-to-nature silvicultural methods has obstacles that can be traced in the statistical analysis in this article. However, there are other important factors that are influencing, mostly hindering the process:

- The technical background of forestry, especially living traditions of forestry technology is lacking in actively applied close-to-nature methods. Even forest planning is challenged by the task of how to incorporate uneven-aged forests in the present planning protocol. (Frank 2014)
- Wild game damage is reported to be the most important (semi-)natural limiting factor of natural regeneration. Even though wild game management is experiencing a slow decline in terms of trophy quality and financial stability (Schiberna–Szalai, 2015), its lobbying ability is preventing it from fundamental changes.

- The needs of society are usually a basis for arguments in discussions on the development of forestry practice. However, the public perception of nature is significantly different from what is advocated by environmental NGOs as the need of the society. Public opinion is mostly against clearcuts, and less sensitive about delicate differences of regeneration methods or silvicultural operations. (Kapócs-Horváth et al. 2012; Schiberna – Stark 2011, Folcz – Schiberna 2012)
- Lessons learned from afforestation programs suggest that private forest owners prefer easy and simple silvicultural methods, as well as short rotation periods. Consequently, plantation forestry is more suitable for their short term economic goals and is also more suitable for their long term visions (Andrasevits – Schiberna 2005). Afforestations take place mostly in regions where site conditions also make these plantations the best choice.
- Rural development programs also showed that private forest owners are capable of applying more advanced silvicultural methods if they are coupled with subsidies. So the progress of close-to-nature forest management to a great extent depends on targeted forest policy measures.

To have a more realistic view of close-to-nature forest assets management, the possibility to investigate primary functions and regions in addition to looking at differences in sectors exists.

Controlling intentions along facts and knowing the pace and segments of changes would be an advantage when planning future measures.

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Readiness of Forest Officers for Adaptations in Forest Management Planning

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Abstract – Under the framework of a society that enhances the demand for different kinds of ecosystem services, “Forest Management Planning” (FMP) has changed notably over the last decades. As a consequence of budget constraints and the fact that the present forest planning system of the State Forest Administration of Baden-Württemberg has been in operation since 2000, this system has to be developed further. Since the group of forest officers at the county level is the largest user group, it was decided to start a participatory process in order to derive the most relevant requirements of that group. A survey within the board of managing directors followed. In order to gain an insight into the requirements and preferences we used the pairwise comparison method. The paper highlights the preference structure in respect to (1) the goals of FMP, (2) target groups, (3) the FMP process, (4) tasks, (5) and the outputs of FMP. It can be shown that the average perception of FMP of forest officers tends to be more traditional and internal than proactive and stakeholder-oriented. The pairwise comparison approach has been proven successful as a means to get insight in the preference structures.

integrated planning / internal participation / readiness for change / plurality of opinions

Kivonat – Az erdészeti szakszemélyzet alkalmazkodási készsége az erdőtervezés folyamatában. Azon társadalmi keretek között, amelyek a különböző ökoszisztéma szolgáltatások keresletét erősítették, az erdőtervezés észrevehetően megváltozott az utóbbi évtizedekben. A költségvetési korlátok, valamint az a tény, hogy a Baden-Württemberg tartomány jelenlegi állami erdőtervezési rendszere 2000 óta van érvényben, szükségessé teszik a továbbfejlesztését. Mivel az erdőtervek legfőbb felhasználója az erdészeti szakszemélyzet, ezért a részvételükre alapozott folyamat indult el a legfontosabb elvárásaik feltárására. Ezt egy döntéshozói felmérés követte. Annak érdekében, hogy az elvárások és preferenciák köréről belső információk álljanak rendelkezésre, a páronkénti összehasonlítás módszerét alkalmazták. A cikk rávilágít a preferenciák rendszerére (1) az erdőtervezés céljai (2) a célcsoportok, (3) az erdőtervezési folyamat, (4) a feladatok, (5) az erdőtervezés kimenetei tekintetében. Kimutatható, hogy az erdészeti szakszemélyzet erdőtervezéssel kapcsolatos átlagosnak mondható szemlélete jellemzően tradicionális és befelé forduló, és kevésbé proaktív és érdekelt-irányultságú. A páronkénti összehasonlítás sikeres módszernek bizonyult a preferencia szerkezet feltárására.

integrált tervezés / részvételi folyamat / változtatási hajlandóság / vélemények sokszínűsége

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INTRODUCTION

The role of Forest Management Planning (FMP) has changed notably over the last decades. Until the late seventies FMP was mostly seen as an internal, mostly technical procedure, primarily focusing on the productive function of forests. Especially under the framework conditions of a densely populated county with, on average, a highly educated population, the role of forests has changed more and more towards a supplier of various ecosystem services. Except for all kinds of timber processing industries and an initially small, but increasing, number of private timber consumers, the societal interests are concentrated mainly in the recreational and environmental functions of forests. Together with this shift in interests the demand for participatory processes has grown larger. Whenever the use of instruments that are related to sustainable development is foreseen, participation is a standard step during the development, implementation, and mostly during the use of the respective instrument (e. g. sustainability reporting (GRI 2103) and the Agenda 21 processes (Heinrichs 2007, Feindt – Newig 2005). There are substantial findings which suggest that planning procedures are seen as good opportunities for communication with and participation of various kinds of stakeholder groups (Sheppard 2005, Joint FAO/ECE/ILO Committee 2000, cited in Beck 2011).

It is not only the external participation, however, that contributes to the success of FMP systems. As these systems are used by a potentially maximum share of members in almost every forest institution, the acceptance of the FPM and other instruments in place can be seen as a key success factor for their application. A means to achieve a sufficient level of acceptance is the involvement of users in the development process (Hartebrodt 2009). Consecutively, not only external participation has to be considered, but also internal participatory processes have to become part of the revision of existing instruments.

The change of societal requirements resulted, at least in Germany, in an increasing dispute between forest owners and/or administrations and stakeholder groups. In particular, environmentalists tend to be generally sceptical and mistrusting towards timber harvesting or at least towards a higher share of conventional management practices. Owners and forest practitioners highlight the increasing demand for all kinds of wood-based raw materials and underline the important role of forest utilisation in a bio-based economy. The willingness to adopt new requirements in the management practice differs widely despite the fact that a relevant part of these requirements rests on the present legal framework, for instances the European Framework Directive on 'Flora, Fauna, Habitat' (European Commission 1992). This directive leads (among other things) indirectly to the upcoming idea of implementing the so-called integrated management plans, which cover both the management of forest production and the management of ecological issues (European Commission 2013).

AIM OF THE STUDY

The purpose of the study was two-fold. First, the objective was to develop a deep and detailed insight into the preferences and requirements of different internal user groups of FMP. The pattern of the preferences was foreseen to be used as a set of decisive criteria for the ongoing revision process of the FMP system. Of special interest was the question whether forest practitioners are ready for an integration of external requirements in FMP and the involvement of stakeholder groups in the FMP process.

Second, it was of interest, if, and to what extent, elements of a decision support system and the related participatory processes are suited in the context of such kind of revision process. Furthermore, it was planned to analyse the consistency of the results in various substrata, the ability of the process to provide additional information about the hetero- or homogeneity of the opinions and the acceptance of the decision process.

CASE STUDY

We used the revision process of the FMP-system of the State Forest Administration of Baden-Württemberg (SFA-BW) as a case study. SFA-BW is organised as a so-called joint forest administration responsible for all types of forest owners (state-owned, communal and private). The state forest service manages the state forest, is responsible for assistance and (technical) support of other forest owners, as well as for the distribution of financial allowances. The state forest administration is essentially responsible for the “planning, preparation, organisation, management and supervision of all kinds of forest management activities” (LWaldG 2012: §47 (1) [translation by the author]) in communal forests. Communal authorities can decide whether to take over this responsibility or not; however, as the state service is free of charge, most communal bodies do not choose to do so. Part of this ‘service-package’ is the process of the FMP, which takes place every 10 years. The FMP is carried out by one department of the middle administrative level. As most communal bodies make use of the state service, there is, consequently, generally one FMP process in place. The revision of this process is used as a case-model for the present study.

Before a final decision about the general structure of the revised FMP process could be made, the board of managers decided first that the needs and requirements of the main user group, which is the forest staff at the county level, should be studied in a way that is able to produce reliable, trustworthy, and presentable results. The main areas of interests (later on dimensions) were objectives (1) and tasks (2) of FMP, as well as tools and products (3) provided by FMP. The CEO defined the need that a clear prioritisation should be undertaken in respect to all dimensions. During the process the decision was made to identify the most important user groups (4) and relevant process steps (5) of FMP as well. During the workshops, information needs were additionally gathered. These results are not included in this paper. It has to be mentioned that there are two FMP-traditions (the western and eastern part of Baden-Württemberg). After a mid-term presentation of the results gathered from amongst representatives of the county level, it was decided to involve the departments of top- and middle-level management and those of the state forest research institute.

METHODS AND DATA

Methods

Workshop with Representatives of the County Level

The results concerning the opinion of the members of the county level were collected during two workshops (WS 1 and WS 2) in December, 2013. In order to determine whether there is a notable difference within the state of Baden-Württemberg, one WS was carried out in the western and one in the eastern part of the state. One had, however, also the option of attending either WS. The WS-procedure in dimensions (which are discussed later in the paper) was as follows: Based on a proposed list of items in each dimension the participants developed a final list and discussed it in terms of their present use and its frequency at the county level. This in-depth discussion was documented on posters and remained visible during the final evaluation session as background information for the participants.

For the final evaluation of the priority of each item we used the pairwise comparison approach (comp. Saaty 2008), which is regarded as suitable for prioritisation of intangible factors. Based on an Excel solution it was possible to transfer the lists of items into a (hard copy) questionnaire, which was filled out by the participants at the final evaluation session. *Figure 1a* depicts a completed questionnaire in the dimension ‘objectives’ (Ziele).

Figure 1a

Ziele	+	=	+	
Gesetzl. Auftrag				Zentrale Datenhaltung öffentl. Wald
Nachhaltigkeitssicherung	X			Zentrale Datenhaltung öffentl. Wald
Betriebssteuerung				Zentrale Datenhaltung öffentl. Wald
Betriebsleitung Land		X		Zentrale Datenhaltung öffentl. Wald
Betriebssteuerung				Zentrale Datenhaltung öffentl. Wald
Betriebssteile UFB	X			Zentrale Datenhaltung öffentl. Wald
Gesetzl. Auftrag				Kundenzufriedenheit
Nachhaltigkeitssicherung	X			Kundenzufriedenheit
Betriebssteuerung				Kundenzufriedenheit
Betriebsleitung Land			X	Kundenzufriedenheit
Betriebssteuerung				Kundenzufriedenheit
Betriebssteile UFB		X		Kundenzufriedenheit
Zentrale Datenhaltung öffentl. Wald			X	Kundenzufriedenheit
Einheitliche Datenstruktur			X	Kundenzufriedenheit
Gesetzl. Auftrag				Klärung Eigentümer Zielsetzung
Nachhaltigkeitssicherung				Klärung Eigentümer Zielsetzung
Betriebssteuerung				Klärung Eigentümer Zielsetzung
Betriebsleitung Land			X	Klärung Eigentümer Zielsetzung
Betriebssteuerung				Klärung Eigentümer Zielsetzung
Betriebssteile UFB		X		Klärung Eigentümer Zielsetzung
Zentrale Datenhaltung öffentl. Wald			X	Klärung Eigentümer Zielsetzung
Einheitliche Datenstruktur			X	Klärung Eigentümer Zielsetzung
Kundenzufriedenheit			X	Klärung Eigentümer Zielsetzung
Fortbildung			X	Klärung Eigentümer Zielsetzung
Gesetzl. Auftrag				Fortbildung
Nachhaltigkeitssicherung	X			Fortbildung
Betriebssteuerung				Fortbildung
Betriebsleitung Land		X		Fortbildung
Betriebssteuerung				Fortbildung
Betriebssteile UFB		X		Fortbildung
Zentrale Datenhaltung öffentl. Wald			X	Fortbildung
Einheitliche Datenstruktur			X	Fortbildung
Kundenzufriedenheit			X	Fortbildung
Gesetzl. Auftrag				Einheitliche Datenstruktur
Nachhaltigkeitssicherung	X			Einheitliche Datenstruktur
Betriebssteuerung				Einheitliche Datenstruktur
Betriebsleitung Land		X		Einheitliche Datenstruktur
Betriebssteuerung				Einheitliche Datenstruktur
Betriebssteile UFB	X			Einheitliche Datenstruktur
Zentrale Datenhaltung öffentl. Wald			X	Einheitliche Datenstruktur
Gesetzl. Auftrag				Betriebssteuerung Betriebssteile UFB
Nachhaltigkeitssicherung	X			Betriebssteuerung Betriebssteile UFB
Betriebssteuerung				Betriebssteuerung Betriebssteile UFB
Betriebsleitung Land		X		Betriebssteuerung Betriebssteile UFB
Gesetzl. Auftrag				Betriebssteuerung Betriebsleitung Land
Nachhaltigkeitssicherung	X			Betriebssteuerung Betriebsleitung Land

Figure 1b

	Gesetzl. Auftrag Nachhaltigkeitssicherung	Betriebssteuerung Betriebsleitung Land	Betriebssteuerung Betriebssteile UFB	Zentrale Datenhaltung öffentl. Wald	Einheitliche Datenstruktur	Kundenzufriedenheit	Fortbildung	Klärung Eigentümer Zielsetzung	Gewichtungswerte (?)	Gewichtungsprozent
Gesetzl. Auftrag		2	2	2	2	2	2	1	13	23
Nachhaltigkeitssicherung	0		1	1	1	0	1	0	4	7
Betriebssteuerung	0	1		2	2	1	1	1	8	14
Betriebsleitung Land	0	1	0		1	0	0	0	2	4
Betriebssteuerung	0	1	0	1		0	1	0	3	5
Betriebssteile UFB	0	1	0	1	2	2	1	1	9	16
Zentrale Datenhaltung öffentl. Wald	0	1	0		1	0	0	0	6	11
Einheitliche Datenstruktur	0	1	0	1		0	1	0	6	11
Kundenzufriedenheit	0	1	1	2	1		1	1	11	20
Fortbildung	0	1	1	2	1	1		0	6	11
Klärung Eigentümer Zielsetzung	1	2	1	2	2	1	2		11	20
Summe									56	100

Figure 1. Questionnaire used for the complete pairwise comparison and its conversion in percental preferences

The pairwise comparison was transformed into a percentage by using a matrix that transforms the individual comparisons into a percental preference (Niklas 2002). This is executed in a way that in the case that the preferred item listed in the rows is more important than the column, a code 2 is used; code 1 is applied if equal importance (=) is seen and 0, when the item (row) is valued as being less important. The sum of the codes related to the individual item (row) is used to derive the importance in percentages of the respective item by dividing by the total sum of codes. *Figure 1b* shows the transformation of the questionnaire shown in *Figure 1a*. The average value for the individual group (WS 1, WS 2, Departments = Dept.) was calculated as a mean-value of the individual questionnaires.

To use these preferences for interpretation it has to be taken into account that the maximum of the percental preference is related to the number of items evaluated. The respective formula is: $100 / (N_{\text{Items}}/2)$. Thus the maximum is limited to the twofold rate of the average priority; the minimum preference value is zero (see also *Figure 2*).

Surveys in the Top- and Middle-Level Management and Research Institute

It was to be expected that in management the evaluation forms would be prepared by a member of the staff, but would have to then be authorized by the head of the department. The use of the questionnaires for a complete pairwise comparison is comparatively time-consuming and does not immediately lead to the percental results, which could be approved easily by the heads of department. Consecutively, a different questionnaire was used in which the individual items had to be evaluated using a four point (forced) Likert scale (+ + = important, + = somewhat important, – = somewhat unimportant, – – = unimportant). In order to receive comparable results in terms of a percental evaluation, Likert values were used. The coding in the evaluation matrix was as follows: 2 was given if the Likert value of the row was higher than the value of the item in columns, 1 in case of equal preference and 0 when the row-Likert value indicated less importance (*Figure 2*).

Items	Likert Value (row)	Item 1	Item 2	Item 3	Item 4	Item 5	Sum	Percental preference
Likert Value (column)		+	– –	–	+ +	+		
Item 1	+		2	2	0	1	5	25
Item 2	– –	0		0	0	0	0	0
Item 3	–	0	2		0	0	2	10
Item 4	+ +	2	2	2		2	8	40
Item 5	+	1	2	2	0		5	25
Sum							20	

Figure 2. Conversion of Likert scale evaluation into percental preferences

Data

We received 13 completed questionnaires in WS 1 and 22 in WS 2. These were questionnaires in which the complete version of the pairwise comparison was performed. Except for the dimension “Tasks”, where we received 14 questionnaires, we had 13 from the various departments of SFA-BW. Here the Likert scale version was used.

RESULTS

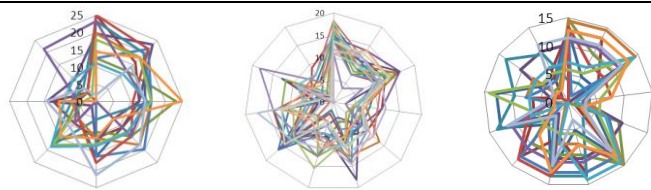
Objectives of FMP

The results show – generally speaking – that the traditional objectives of FMP such as assurance of sustainability and the use of operative management are ranked best from almost all groups. The objectives related to potentially new objectives or external use of FMP (*subsequently generally written in italics*) show normally a clearly lower preference in percentages (*Table 1*).

Table 1. Objectives of FMP

FMP as a means for:	Mean WS 1***	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Maximum preference in percentages	25.0		18.2		16.7	
- assessment of sustainability as a responsibility of the public administration	17.6	0.39	14.4	0.15	11.0	0.31
- operative management on local level	15.8	0.25	12.5	0.19	9.9	0.36
- operative management on board level	10.5	0.58	10.1	0.24	12.2	0.23
- ensuring customer / user satisfaction**	12.0	0.46	10.3	0.33	5.3	0.55
- provision of a standardised data structure	7.9	0.54	8.2	0.33	10.3	0.27
- clarification of strategic forest management goals	17.3	0.22	*	*	7.9	0.58
- vocational training	12.7	0.35	8.1	0.43	3.1	0.83
- centralised data storage on state level	6.2	0.85	6.6	0.37	9.3	0.37
- assessment of sustainability for individual forest enterprises / associations	*	*	11.6	0.31	6.8	0.69
- <i>evaluation and management of ecosystem services</i>	*	*	8.4	0.53	7.2	0.61
- <i>external quality control</i>	*	*	6.9	0.61	6.3	0.64
- <i>enhancement of transparency for stakeholder groups</i>	*	*	3.0	0.94	5.3	0.66
- <i>provision of a framework for participatory processes</i>	*	*	*	*	5.3	0.70

Pattern of heterogeneity



* Not proposed, discussed and evaluated in the respective workshop. This is a clear indication of lower importance. It leads, however, to a slight average increase of the preference values in WS 1.

** Satisfaction in terms of satisfaction with the whole organisation and their offers.

*** One item not matching this dimension was removed from the list.

The coefficients of variation (CV) show mostly a lower or medium level with regard to the traditional objectives. However, even the CV provides only an overview of the variations of the preference patterns of the individual respondent. Based on the percental preference, net-graphs give an insight into the homo- or heterogeneity related to the individual dimension and respondent (*See graphs at the bottom of tables 1-5*). Despite the fact that individual differences are given, it can be stated that there is a lower heterogeneity at the county level in comparison to the evaluation of the departments.

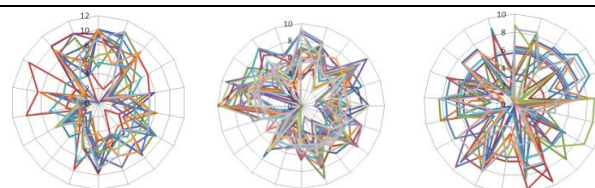
Tasks of FMP

It has to be mentioned again that the traditional tasks such as the control of the realisation of forest management plans are in the front. With regard to new requirements, the medium preference of the “integration of Natura 2000 management planning” task indicates that this aspect has gained importance in the last few years. There is strong evidence that the (already existing) use of external stakeholder groups (e.g. based on the Act on Information about Environment) is not seen as a preferred task of the FMP at the county level, whereas these functions are evaluated on average with more or less equal importance by the various departments. The heterogeneity on the county level (WS 1 and WS 2) was limited, however it was very significant at the department level. (Table 2).

Table 2. Tasks of FMP

	Mean WS 1	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Maximum percental preference	10.5		11.8		9.5	
Control of FM-Plans realisation	7.7	30.4	6.5	14.1	5.7	41.7
Planning of ranger districts	8.1	30.1	6.4	26.7	5.1	45.9
Data base for GIS Applications	7.3	24.3	5.8	30.0	6.4	32.6
Planning on stand level	7.0	40.0	7.1	17.8	5.2	42.9
Inventory of basic forest data at stand level	6.8	31.8	4.9	39.3	6.2	27.0
Proliferation of detailed data for individual stands	6.4	37.8	6.1	23.9	5.1	52.6
Integration of Natura 2000 management planning	5.4	40.7	4.6	25.2	6.2	32.8
Harmonisation of conflicting goals	5.7	31.9	4.5	39.9	5.0	51.6
Database for reporting	4.5	36.7	4.8	36.7	5.9	42.2
Database for financial planning	6.2	34.5	5.1	31.3	3.7	68.6
Control of silvicultural standards	6.1	24.7	4.5	30.6	4.1	56.9
Database for in depth analysis of special cases	4.6	48.4	4.4	37.9	5.3	48.6
Silvicultural training	6.3	32.4	4.4	28.4	2.3	97.1
Vocational training	5.0	44.0	3.5	38.1	3.1	70.4
Provision of information for forest certification(FSC/PEFC)	3.6	69.2	2.0	66.6	5.3	47.7
Integrated (environmental, managerial planning) at stand level	*	*	5.2	36.8	4.8	38.2
Process development	3.6	35.8	3.0	54.3	3.1	78.6
Database for Sustainability Balanced Scorecard	3.3	74.5	*	*	5.1	47.4
Database for proliferation of information based on the act on information about environment	2.4	129.0	*	*	5.0	43.5
Forest monitoring	*	*	*	*	4.3	59.1
Information on areas suitable for compensation for environmental relevant impacts	*	*	*	*	2.9	98.2

Pattern of heterogeneity



* Not evaluated. Due to the lower share of non-evaluated items there is no relevant impact on the average preference pattern of the other items.

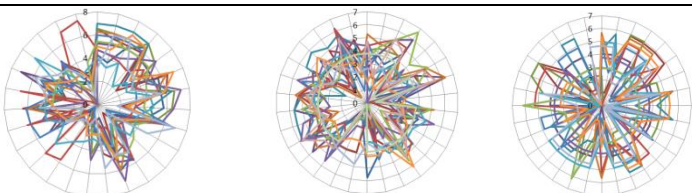
Tools and Products of FMP

The high preference for traditional outputs of FMP is even stronger at the county level when the question for tools and products is raised. The highest percental ranking receives the total felling budget, stand register, and planning information on stand level. The evaluation of the departments' questionnaire shows a more evenly structured preference pattern. As in the other dimensions examined, the role of new products meets on average wide scepticism amongst the representatives of the county level, but the normally high CV indicates that a smaller part of the group has a different view on these externally used products. With regard to the preference pattern of the individual evaluator, it can be shown that we have here a tremendous heterogeneity in all groups. The requirements seem to vary significantly among different regions or under a different thematic scope of the departments (*Table 3*).

Table 3 (part 1). Tools and Products of FMP

	Mean WS 1	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Maximum percental preference	6.9		6.9		6.3	
Total felling budget	5.5	0.19	4.5	0.24	4.1	0.34
Resuming of silvicultural measures	4.9	0.23	4.5	0.20	4.1	0.34
Forest GIS	4.7	0.31	4.5	0.22	4.2	0.30
Stand register	5.5	0.17	3.5	0.43	4.0	0.36
Management plans for individual stands	5.4	0.26	4.0	0.36	3.6	0.47
Digital maps	5.3	0.22	3.4	0.36	4.3	0.26
Digital stand information	3.4	0.33	4.1	0.22	4.3	0.21
Resuming of activities in areas under different kinds of treatment (planting, pruning, harvesting ...)	5.2	0.22	3.2	0.42	2.7	0.49
Traditional (hardcopy) maps	5.3	0.21	3.0	0.47	2.7	0.54
Permanent comparability between plan and completion on stand level	4.1	0.43	4.3	0.17	2.6	0.51
Plan for individual ranger districts	4.7	0.31	3.6	0.39	2.3	0.70
Standard reports	3.3	0.46	4.4	0.18	2.9	0.54
Digital cadastral information	2.9	0.47	3.5	0.34	4.0	0.26
Information about structure and spatial affiliation of land parcels	3.4	0.49	3.8	0.24	3.2	0.40
Maps about specialised questions	3.6	0.37	3.8	0.23	3.0	0.44
Management summary for decision-makers	4.1	0.38	3.4	0.30	2.7	0.58
Special analysis	2.6	0.64	3.7	0.22	3.4	0.32
<i>Mapping of forest habitat types</i>	2.5	0.70	3.5	0.42	3.4	0.36
Strategic management planning on enterprise level	4.2	0.31	2.1	0.53	2.9	0.56
Provision of time series	2.4	0.45	2.7	0.47	3.3	0.42
Felling plan structured by timber-assortments	3.8	0.43	1.5	0.62	2.9	0.66
Operations analysis	2.9	0.39	2.6	0.44	2.6	0.87

Table 3 (part 2). Tools and Products of FMP

	Mean WS 1	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Management contract between owner and manager	0.0	0.00	4.7	0.24	3.2	0.54
Experts' opinion for the management of the elapsed period	2.3	0.43	2.8	0.33	2.2	0.64
Specialised analysis for different zones	0.0	0.00	3.4	0.32	3.5	0.55
Forest statistical report	1.8	0.44	2.0	0.82	2.8	0.47
List of individual stand matching special criteria	0.0	0.00	3.5	0.30	2.3	0.65
Digital information for external stakeholders and partners	1.7	0.89	1.5	0.94	2.3	0.78
Digital GIS information for external stakeholders and partners	1.8	1.02	1.4	0.96	2.3	0.78
Map of Natura 2000 areas	*	*	*	*	3.5	0.22
Description of present state of stand level	*	*	*	*	3.0	0.56
Dynamic maps which depict changes over time during a planning period.	*	*	*	*	1.8	0.70
Pattern of heterogeneity						

* Not assessed at the county level.

Users of FMP

The analysis of the preferred user groups shows a clear result. There is a wide consensus that the state FMP system should be suited for a wide range of forest users. Except for the private forest owners, which are not favoured by the departments, all ownership types and managers of different levels show a distinct and greater importance. The comparatively low CV related to the forests users indicate a low heterogeneity, which is additionally supported by the patterns of heterogeneity (Table 4).

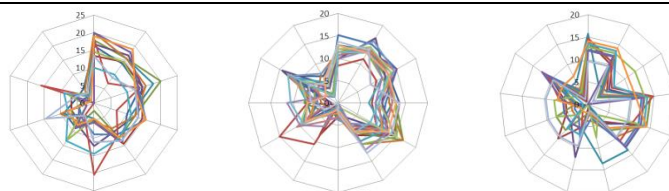
Process Steps

It can be stated that there are two process steps which are ranked best in all groups. These are the joint inspection of the individual stands and a discussion about the core objectives to be executed during the next ten-year planning period. The potential role of the FMP as a platform for participatory processes was only assessed at the department level and was not seen as playing an important part of the FMP process. However, as it is normal for new aspects, it showed a high CV, indicating different opinions at the department level.

Table 4. User groups of FMP

	Mean WS 1	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Maximum percental preference	20.0		16.7		15.3	
Owners and managers of state forest land	14.2	0.18	11.5	0.13	13.2	0.12
Owners and managers of communal forest land	16.8	0.19	13.8	0.09	11.5	0.21
Owners and managers of private forest land	14.3	0.25	12.4	0.16	5.5	0.65
Managers on board level (state forest)	12.2	0.13	10.7	0.21	12.8	0.11
Managers on local level (including forest rangers)	12.4	0.19	12.8	0.18	11.7	0.32
Other administrations	7.8	0.38	7.6	0.37	9.0	0.37
Hunters	2.5	0.60	2.1	0.51	3.2	1.15
NGOs	5.2	0.79	3.2	0.80	5.8	0.56
Citizens	8.0	0.65	7.1	0.51	5.6	0.48
Timber consumers	6.6	0.59	5.9	0.44	4.3	0.68
Forest associations	*	*	8.5	0.43	5.2	0.45
Certifiers	*	*	4.4	0.46	9.1	0.32
Adjacent forest owners	*	*	*	*	3.3	0.66

Pattern of heterogeneity

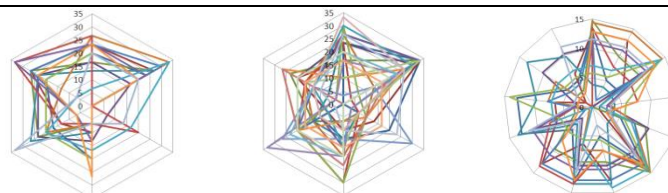


* Not assessed in the respective WS.

Table 5: Importance of process-steps in the FMP-process

	Mean WS 1	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Maximum percental preference	40.0		40.0		33.3	
Joint inspections (district ranger and a member of FMP organisation)	23.1	0.38	24.4	0.38	19.5	0.43
Discussion about a set of objectives	20.0	0.28	20.3	0.43	23.3	0.22
Debriefing	17.7	0.46	16.3	0.44	16.9	0.50
Negotiations during FMP process	13.1	0.48	14.9	0.54	19.2	0.45
Participative processes with external stakeholders	*	*	*	*	11.9	0.89
Mid-term meeting	4.4	1.69	9.4	0.82	10.0	0.97

Pattern of heterogeneity



DISCUSSION

Objectives

The results give a clear indication that traditional goals of FMP are still absolutely predominant. FMP as a means to control the forest enterprise at the local level or to ensure the legal obligation to manage forests in a sustainable manner are emphasised homogenously at the county level and at the department level. The results from the two workshops at the county level show a wide overlap, hence we can conclude that the underlying hypothesis that no relevant regional differences exist was proven successfully. However, it is evident that some differences remain as well. The clarification of the set of goals of the individual owner is much more important at the county level and the same applies for the satisfaction of most communal users of FMP. Still, this applies for the internal use of FMP as well. All 'new' objectives are on average of lower priority; at the local level the results indicate that there is tremendous scepticism towards integration of such kind of objectives when designing a new FMP processes. The reasons behind this attitude were not assessed during the process; however, the novelty of these requirements may play a substantial role. It has to be pointed out that a higher CV indicates that there is a smaller share of county representatives, who displayed a different opinion. The awareness seems to differ notably at the local level, which corresponds with the wide variety of framework conditions reaching from condensed urban areas to rural landscapes. One should expect that these 'new objectives' are of much higher relevance on the upper management levels. Despite the fact that the average evaluation shows a higher ranking at the department level than in the counties, it has to be stated that there is no common evaluation of these new potential objectives at the department level either.

Tasks of FMP

Firstly, it has to be mentioned that the plurality of opinions is mostly higher when individual tasks of FMP are analysed. We found a lower CV (<0.40) for roughly only 50% of the tasks, which indicates that there is a broader consensus about the importance of the individual task; only five tasks could be identified, which are seen as being of greater relevance in all groups. With regard to the operative tasks of FMP, analysis shows that the requirements of the local level are completely different from those of the departments. County members voted definitely for tasks, which are in context to silvicultural activities on the stand and district level, whereas the departments showed a higher affinity to external functions of FMP such as certification, the controlling of strategic goals in the Sustainability Balanced Scorecard e.g. Here we identify a notable difference between the requirements of the different management levels and thus likely a point of future disputes in the case that the revised version of FPM is not able to cover both the preferred tasks of the local level and the wider range of tasks evaluated as being important by the departments.

Process Steps

Above all, it has to be realised that the heterogeneity of opinions about the importance of individual process steps is on a medium level, but there are no differences on average between the two workshops at the county level. With regard to the FMP processes, it turns out that there are only two process steps which are seen as prevalent: first, a joint inspection of the individual stands by the local ranger and the person who is responsible of the FMP; second, a discussion about the set of objectives, which received homogenously high preference in percentages. According to the findings discussed below, the possibility of the integration of external stakeholders meets wide scepticism. Again, the exclusion of externals becomes visible, and it can be shown that it reflects not only the opinion at the county level. At the

department level the heterogeneity, indicated by a high CV of 0.89, indicates various points of view on this account too. Unless it is known that there is a high demand from external stakeholder groups (environmental NGOs play the most substantial role), no common understanding of whether a framework for an external participation should be integrated in the FMP process was developed thus far, not even at the medium and upper management level.

Tools and Products

The results of the analysis of the tools and/or products provided by the FMP mirror those of the tasks and objectives. Again, traditional products/tools are characterised by a homogenously higher or medium preference. It can be shown that the preference structure of the department level differs substantially from that of the counties, where products which can be used directly from the field foresters are ranked - foreseeably- higher. Half of the products - mostly traditional ones - are evaluated to have a limited heterogeneity, and such is the case especially at the county level. The notably higher heterogeneity observed for products, which are suited to be used by or even mostly dedicated to externals, highlights the greater differences between the counties and departments in terms of relevance of participation and issues such as ecosystem services.

Users

The importance of different users of FMP is very homogenous when we consider the traditional users and stakeholders, which are the various communal enterprises (here especially at county level) and the representatives and managers of state forest land at the local and board level. New, mostly external users are viewed very sceptically at the county level. Other administrations and certifiers receive a homogenous, but only medium high, preference at the department level. Citizens and forest associations are, in general, of low importance. The higher CV indicates again that it needs the direct perception of a demand from external stakeholder groups, which can be observed only locally or in some departments that are confronted with these external requests. Consequently, the results reveal that it is again the traditional mind-set that dominates the approach regarding the users of FMP. It can be questioned whether this is forward-looking in a time, where political decision-makers have decided to publish detailed information and data from the FMP to the public.

Summarising comments

The patterns of the preferences confirm the expectations. For most members of forest administration, FMP has to primarily fulfil the traditional functions of their silvicultural activities. However, the heterogeneity even at the county level shows that the demand for new aspects differs widely. This corresponds with the tremendous variability of the framework conditions under which forest management takes place in Baden-Württemberg. It varies from forests situated close to urban congestions, which are to some extent heavily influenced by a high share of academically educated people, to rural regions where primary productions still play a significant role. It has to be stated that up to now no widespread intrinsic motivation to adopt these new aspects exists; it is more of an externally forced local shift in areas where a higher demand for societal participation has already developed. Furthermore, this plurality of opinions is not limited to the county level. At the middle and top management levels the heterogeneity is similar, but evidently and expectably the perception of the increasing demand of stakeholders for information and products from FMP is higher.

From a methodological point of view it can be confirmed that the pairwise comparison methods, which have met scepticism before the beginning of the process, have proved successful. The results show a clear consistency over the individual dimensions. Forest

management experts and decision-makers from the state forest enterprise unanimously stated that the results are to the point. The ability to arrange the individual items into a matrix with the axes corresponding to the importance and consentaneity can be used as guidance for strategic decisions about the core objectives and structural components of a future FMP-process. Despite the fact that the results proved the existing hypotheses in almost every case, additional information about the degree of consensus and presentability in the future process were identified as a valuable benefit of the process.

CONCLUSIONS, RECOMMENDATIONS AND OUTLOOK

The questionnaire and pairwise comparison methods can be seen as helpful tools when a clear and visible prioritisation is needed. Particularly the opportunity to deliver results, which are - due to its participants' absolute anonymity - more or less uninfluenced by hierarchical structures, is suited to derive an insight into the individual opinions in a group and reduce the chance to show tactical response behaviour.

The number of assessment criteria related to a topic or a dimension should be limited to 15-20 items. Questionnaires, which require up to 450 entries, are very time-consuming and are only applicable in groups with a strong willingness for cooperation. Means for reducing the number of items can be seen in a pre-selection using less sophisticated methods or the use of a higher number of dimensions or topics. When using (hardcopy) questionnaires, the result cannot be displayed in a workshop setting. This non-visibility leads to some degree of disappointment amongst the participants. The use of digital surveying methods is, when applicable, better suited when the results should be presented immediately. Furthermore, it reduces the workload of data entry tremendously. Excel applications can also be designed easily.

The percental preferences can and will be used as a framework for the application of a decision support tool. At the present stage this will be a utility analysis in which different structurally diverse FMP alternatives are compared using the percental preferences as utility values. The data could be used in other decision support systems (DSS) such as the Analytical Hierarchical Process. Regardless of which DSS is used, only the structured data derived from the evaluation process described above will allow for an undertaking of further supportive activities such as sensitivity-analysis or a comparison of different variations of the upcoming FMP in the ongoing development process in a reliable und trustworthy manner.

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Balance Impossible? Between Customizability and Comparability of Employee Satisfaction Surveys

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Abstract – In a significant share of cases, when multi-objective management systems (e.g. Balanced Scorecard, Quantum Performance Measurement) are in use, the goal of employee satisfaction is part of the set of strategic goals. Quite frequently, this goal is flanked by an indicator, mostly a so-called employee satisfaction index, which is frequently derived from an employee satisfaction survey (ESS). On one hand such a survey has to reflect the characteristics and structure of the enterprises, on the other hand it is known that the question for intercompany-comparison turns up immediately after the disclosure of the results. The paper discusses the results of a meta-analysis of ESS in seven of the larger forest enterprises in Germany. The main topics are underlined and the problems of comparability of customized ESS are shown, while focusing on both wording and scales used for their measurement. A methodological approach of dealing with various scales is discussed based on the results of inter- and intra-company ESS. A vision of a common ESS framework is outlined.

intercompany comparisons of employee satisfaction / transformation of Likert-scales

Kivonat – Lehetetlen középút? A munkahelyi elégedettségi felmérések testreszabhatósága és összehasonlíthatósága. Az esetek jelentős részében, amikor többcélú vállalatirányítási rendszerről (pl. kiegyensúlyozott stratégiai mutatószám-rendszer, quantum teljesítmény értékelés) van szó, a stratégiai célrendszer része a munkahelyi elégedettség. Gyakran, ezt a célt az ún. munkahelyi elégedettségi indexszel jellemzik, amelyet a munkahelyi elégedettségi felmérésből származtatnak. Egyrészt egy ilyen felmérés vissza kell, hogy tükrözze a vállalkozás egyedi szerkezetét és jellegzetességeit, másrészt tudható, hogy a vállalkozások közötti összehasonlíthatóság igénye azonnal megjelenik, amint a vizsgálat eredményei megszületnek. Ez a cikk a munkahelyi elégedettségi felmérések meta-elemzését tárgyalja Németország hét nagyobb méretű erdészeti vállalata példáján. Az írás bemutatja a főbb témaköröket és az egyedi munkahelyi elégedettség felmérések összehasonlíthatóságát az alkalmazott fogalmak és a mérési skálák tekintetében. A különböző mérési skálák összevetésével kapcsolatos módszertani kérdésekre a vállalkozáson belüli és vállalkozások közötti munkahelyi elégedettség felmérések alapján szintén kitérnek a szerzők. A munkahelyi elégedettség felmérések jövőbeli közös általános kereteit felvázolják.

munkahelyi elégedettség felmérések vállalkozások közötti összehasonlítása / Likert skála transzformációja

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1 INTRODUCTION

1.1 Preface

Employee satisfaction is an objective that is on the agenda in almost all of the larger institutions. Especially if there are multidimensional (performance) management systems in use, it can be seen that the goal of ‘employee satisfaction’ is typically part of the set of strategic targets. A higher share of these ‘modern’ management systems, e.g. (sustainability) balanced scorecard, use indicators for the measurement of successes or failures in executing the strategy. In the case of the employee satisfaction, this is mostly an index value and in almost all cases the methodological approach is an employee satisfaction survey (ESS). The literature highlights, on one hand, the need for the characteristics of the individual organisation to be addressed in ESS; on the other hand, the matter of comparability is discussed. As participation of targeted groups is seen as a precondition for the later acceptance and success of the following measures, the issue of comparability is generally less important in the period of the design of the ESS. This changes notably when the results are published. After a short discussion of its own results, unavoidably the question of: “How does our company compare to other institutions?” arises. The question and core topic of the paper is whether a balance between customizing and comparability is possible.

1.2 Contents

Intensive research has been undertaken in past years in relation to the topic of employee satisfaction surveys (ESS). There is a consensus that these surveys cover on average all topics, which are evaluated as being important for employee satisfaction (Borg 2003). However, the opinions regarding what the minimum requirements of such a survey should be differ strongly. Borg (2003) underlines that most surveys include a combination of standard topics and questions related to the particular situation of the institution. This is even the case when the motive for the survey seems to be very specific. This can be explained by the fact that a narrow range of topics can result in a more or less strong refusal by the members of the institution. In addition, it can be stated that there is no unique recommendation on what the set of standard topics should be. Nonetheless, desktop research showed that there is a discussion about some type of an intersection-set of questions, which appears in a relevant number of questionnaires (inter alia. Balmer et al. 2000).

Borg (2003) classifies 11 standard contents from the point of view of the members of the institution and 9 performance and strategy-related contents, which are of particular relevance for the institution as such. He derives a structure for three areas of interest from these findings. Hossiep & Frieg (2008) undertook a study of 820 of the largest enterprises in Germany, Austria and Switzerland. They identify 19 standard and performance topics and 9 psychological issues, which are addressed in ESS. If this set of topics is split up into a stratum, which occurs in more than 50% of the surveys and one which is less frequent, a three-part classification emerges. This three-partite structure is basically confirmed by Bösch (2011), who identifies three standard topics that are part of almost every ESS, five that are frequent, and seven contents that are related to psychological, social or ethical issues. Fischer et al. (2008) do not define areas of interest. They define 12 fields of questions, which are seen as being the most important key drivers for satisfaction and commitment of employees. Domsch & Ladwig (2000) and the European Foundation for Quality Management (EFQM2013) define 9 areas of interest; from which five (so-called enablers) have a stronger relationship to the issue of employee satisfaction.

From the findings above, it can be subsumed that there is some type of an understanding of the important aspects, which are part of ESS, but the opinions about how to structure these

topics differ notably. As a reason for this heterogeneity, two main aspects seem to be of special significance: the need to develop a case-related solution (a) and the participation of the employees (b).

- (a) Evaluation theory tells that core objective of every evaluation is answering the specific questions (Rossi et al. 2004). Borg (2003) and Fischer et al (2008) point out that the content of any kind of ESS should be related to the objective of the study, which means that the mere use of a standard set of questions would be misleading.
- (b) As participation of employees in the stage of the development of ESS is recommended in order to cover all relevant aspects from the point of view of the employees, some very specific contents and / or questions are to be expected. Unless this is seen as a constraint with the later comparability of the results, this participation is seen as a precondition for the acceptance of the results and the consecutive measures (ibid.).

1.3 Scales

As shown for the contents, there is also no consensus about the use of scales in ESS. The spectrum ranges from the statement that there are no good or bad scales, but appropriate and inappropriate scales related to the respective questions (HBS 2002), to specific findings on what the best solution is (e.g. Cummins and Gullone (2000): no five point (odd) scale; e.g. Sturgis et al. (2014): pro neutral alternative). There is a certain consensus that five-point Likert scales are frequently used, and one should not exceed nine categories (Eurostat 2004). Less homogeneity can be found related to the question of whether balanced or unbalanced scales, or even or odd scales were favourable and also about the meaningfulness of a 'don't know' alternative.

1.4 Calculation of Index Values

It can be shown that there are different types of index values which are subsumed under the headline of ESS. Bösch (2011) differentiates between four types: (1) satisfaction-index, (2) leadership-index, (3) commitment-index and (4) acceptance-index. Evidence shows that there are various sets of questions, which are related to the respective indices. However, there is a wide overlap between sets related to different indices and evidently no consensus exists in terms of which question supports which type of index-value. Despite the fact that there is a discussion about the accuracy of deriving arithmetic means from ordinal and/or nominal scale by coding them with discrete numeric values, this is applied in almost all cases. After coding the questions, two basic approaches of deriving an index value from the questionnaires are used. The first one can be titled as the 'all questions approach'. Here the results of all individual questions are included in the calculation of an index, partially after calculating means of sections and combining these means to an overall index. The second approach can be subsumed under the 'index-question' method. Here a special set of questions, which are used to derive the overall satisfaction index, is included. These questions are frequently intended and used to include the antecedent section too.

2 MATERIAL AND METHODS

2.1 Material

As the study was embedded in an ESS-project under the umbrella of a Sustainability Balanced Scorecard (SBSC) project, which is a management approach more suited mainly for medium-sized and larger forest entities, it was decided to include only larger forest organisation in the

German-speaking regions. It was possible to identify six ESS studies from the past six years, which could be compared with the one of the state-owned Forest Enterprise of Baden-Württemberg from 2013. The comparative studies are listed in *Table 1*.

Table 1. List of comparative studies

Institution	Year
State Forest Enterprise Saxony-Anhalt	2007
State Forest Enterprise of Hessen (HessenForst)	2009
State Forest Enterprise of Bavaria (BaySF)	2010
Forest Research Institute Baden-Württemberg (FVA)	2010
State Forest Enterprise Mecklenburg-West Pomerania (Landesforsten M-V)	2010
Forest Research Institute of North-Western Germany (NW-FVA)	2011

2.2 Methods

The study focusses mainly on four topics. It was of special interest whether:

- the ESS forest case study addresses topics that are seen as being important in the general literature about ESS
- the wording of questions allows for a comparison between individual questions
- the scales applied allow for a direct comparison
- a normalisation of scale can be used in the case that comparable questions are evaluated with different scales.

The methodology applied in respect to these areas of interest is described below.

2.2.1 Topics

Different authors used a “frequency-approach” to classify the importance of the topics; this method was applied in this paper in order to identify the most important topics for further research. Based on desk research, six classifications were combined in a meta-analysis. Borg (2003), Hossiep & Frieg (2008) and Bösch (2011) use a three-partite scale, which was included directly into the meta-analysis with three, two, and one points respectively. Domsch & Ladwig (2000) differentiate their results into core topics and sub-items. Core topics were valued with two points, whereas sub-items receive a one point value. Bröckermann & Müller-Vorbrüggen (2010) and Fischer et al. (2008) define a limited set of key drivers which were coded with two points. The standards of the EFQM were – due to their international significance -ranked higher. In the case that a topic is listed in the standards of EFQM, three points applied. In a second step, the comparative questionnaires were analysed to determine if they contained questions related to the single topics that are included in the questionnaire; if they did, those questions were counted. The sum of points related to the individual topics was used to derive a ranking of important topics. For the most important topics, the number of questions in the comparative studies was analysed.

2.2.2 Questions and their Wording

The ‘handbook for [...] questionnaire-development’ issued by Eurostat (2014) states: “Minor changes in wording can also have a significant effect on responses”. Together with findings that standardized questions (questionnaires) are preferable whenever comparability is needed, it can be stated that it is widely accepted that the results of ESS can only be used for comparison studies in cases where the wording of the individual questions is more or less identical. Therefore, the questions in the ESS were assigned to the list of topics. Using text analysis, it was tested to see if a direct comparability of the wording was feasible or not.

2.2.3 Scales

The scales used in the questionnaires were analysed. Of special interest were:

- number of categories
- type of scale (ordinal / cardinal)
- use of a “don’t know” category
- even or odd number of categories
- the use of a neutral category
- whether the wording for the scales applied was balanced or unbalanced

2.2.4 Normalisation

Based on the analysis of the questionnaires, a small set of questions from two comparative studies and the ESS from ForstBW from 2013 could be identified; these showed a sufficient similarity of wording, but different scales. For this small subset, the results have been normalised using formula (1):

$$\frac{x_i - x_{min}}{x_{max} - x_{min}} * 100 \quad (1)$$

x_i = Likert code resp. mean of Likert code

x_{max} = Maximum Likert code

x_{min} = Minimum Likert code

The factors derived from this normalisation were applied to the results of the individual questions in the ESS. *Table 2* gives an example of this kind of normalisation.

Table 2. Normalisation of different scales

Likert code	% Value	Likert code	% Value
6	100	5	100
5	80	4	75
4	60	3	50
3	40	2	25
2	20	1	0
1	0		

3 RESULTS

3.1 Topics

In total, 44 topics were identified from which 10 reached more than half of the maximum sum of points derived from the six studies included, and were furthermore used as the most important topics. A second group, which reached a quarter to half of the maximum value, is depicted as well (*Table 3*). Here we found 16 topics. At the bottom of *Table 3* the topics of lower importance (three points and less) are listed.

Table 3. Priority of topics in ESS studies

Topics	EFQM (from Bösch 2011)	Bösch	Bröckermann & Müller- Vorbrüggen	Domsch& Ladwig	Borg	Hossiep& Frieg	Max 16
Leadership / immediate superior	3	3	2	2	3	3	16
Cooperation / team (colleagues, service providers dept.)	3	1	2	2	3	3	14
Working conditions and safety	3	1	2	2	3	3	14
Advanced training / prospects		3		2	3	3	11
Functions and duties / objectives		1		2	3	3	9
Pay / statutory benefits / gratuities		1		2	3	3	9
Staff retention / fluctuation	3	1	2			3	9
Working atmosphere	3	1	2		3		9
Communication / information		1		2	3	3	9
Processes / internal organisation	3	1	2		3		9
Customer orientation / customer retention		1	2		2	2	7
Job satisfaction / overall satisfaction		1	2	1	3		7
Identification / commitment / emotional bonding		1	2		3		6
Assertion of strategy		1			2	3	6
Image / communication / attractiveness		2		1		3	6
Management of innovations		1			2	2	5
Motivation, performance / productivity				1	2	2	5
Workload/ stress / burnout		2		1	1	1	5
Equitableness and acceptance		1		1	1	1	4
Empowerment/ accountability and freedom / participation		2			1	1	4
Self-respect and perspectives		2		1	1		4
Quality (products/ services)					2	2	4
Motivation		1	2	1			4
Work-life balance		2			1	1	4
Change management					2	2	4
Project management					2	2	4
Topics of lesser importance							
Uncertainty of employment; Deficits / Potentials for improvement; Change of legal status, Reorganisation, Fusion; Engagement; Discrimination; Confidence in management und enterprise; Working hours schemes; Media; Social capital; Diversity; Mobbing; Demographic change; Confidence; Management instruments; Health management; Career planning / Career supervision; Management trends; Psychological contracts							

The analysis of the number of questions related to the most important topics used in the ESS showed that seven out of ten of the very important topics are addressed in the forest institutes' ESS as well. However, it has to be kept in mind that the intensity, in terms of number related questions, differs notably. The topics "payment, statutory benefits, gratuities", 'staff retention, fluctuation' and 'working atmosphere' are covered weakly in the studies (Table 4).

Table 4 Coverage of key topics in ESS in forest institutions

	Bavaria 2010	Hessen 2009	Saxony-Anhalt	Mecklenburg-West Pomerania	North-Western Research I.	Research I. Baden-Württemberg	Average Number of Questions
	Numbers of Questions						
Leadership / line manager	16	11	4	9	4	5	8.2
Cooperation / team (colleagues, service providers, departments)	9	8	1	0	1	3	3.7
Working conditions and safety	5	3	1	11	4	7	5.2
Advanced training / prospects	4	5	5	6	2	3	4.2
Function and duties / objectives	5	6	3	8	1	5	4.7
Pay / statutory benefits / gratuities	1	2	1	0	0	0	0.7
Staff retention / fluctuation	0	0	1	0	1	0	0.3
Working atmosphere	3	1	1	0	2	2	1.5
Communication / information	16	9	3	11	7	4	8.3
Processes / internal organisation	8	4	5	3	8	5	5.5

3.2 Wording

In the following table, the translation of the set of questions used for two topics is shown. It appears that the questions can differ widely and that only in a small share a direct comparability can be undertaken (Tables 5 and 6).

Table5. Examples for the different wording of questions related to the topic 'Leadership / Direct superior'; Subtopic appreciation

Original wording in German	Equivalent wording in English
Das Verhalten meiner direkten Führungskraft mir gegenüber ist von Wertschätzung geprägt.	The behaviour of my direct superior is based on respect.
Mein Vorgesetzter spricht seine Anerkennung aus, wenn ich gute Arbeit geleistet habe.	My direct superior expresses his/her appreciation, when I have done a good job.
Ich bin mit der Wertschätzung meiner Arbeit durch meinen direkten Fachvorgesetzten zufrieden.	I am satisfied with the appreciation shown by my direct superior.
Ich bekomme Lob und Anerkennung von meinem direkten Fachvorgesetzten gezeigt.	I receive praise and appreciation from my direct superior.
Werden von ihrer Führungskraft gute Leistungen erkennbar gewürdigt?	Does your manager clearly display appreciation for a good performance?
Mein Vorgesetzter lässt mich auf verschiedene Art wissen, dass meine Leistungen anerkannt werden.	My superior lets me know through different ways that my good performance is recognised.
Erkennt ihr Vorgesetzter gute Leistungen lobend an?	Does your superior recognise a good performance?

Table 6. Example for different wording of questions related to the topic
'Cooperation / Team (colleagues, service providers, departments)'

Original wording in German	Equivalent wording in English
Zusammenarbeit zwischen den Organisationseinheiten.	Cooperation between the individual units.
Die Zusammenarbeit meines Teams mit anderen Arbeitsbereichen innerhalb der Dienststelle ist so, dass wir gute Arbeitsqualität erbringen können.	The cooperation between my team and other units works in a way that we can achieve a good working quality.
Mit anderen Fachbereichen wird gut zusammengearbeitet	The cooperation with other units works well.
Die Arbeit in meinem Team funktioniert gut	My team works well together.
Wie zufrieden sind sie insgesamt mit der Zusammenarbeit mit Kollegen aus andern Abteilungen/Teams?	How satisfied are you in general with the cooperation with colleagues from other departments?
Zwischen meiner Abteilung/ Arbeitsgruppe und anderen Abteilungen/ Arbeitsgruppen besteht eine gute Kooperation.	There is good cooperation within my department / group and other departments / groups.
Wie beurteilen sie die Zusammenarbeit mit den Kollegen anderer Abteilungen/ Gruppen?	How do you assess the cooperation with colleagues from other departments / groups?
Zusammenarbeit mit anderen Abteilungen/ Teams (internen Kunden oder Lieferanten)	Cooperation with other departments / teams (internal customers or providers)
Aus meiner Sicht ist die Zusammenarbeit a) innerhalb meiner Abteilung reibungslos b) zwischen den Abteilungen gut.	From my point of view the cooperation a) in my department works unobstructed b) between the departments is good?
Die Zusammenarbeit zwischen der Zentrale und den Forstbetrieben funktioniert reibungslos.	The cooperation between the general office and the local units runs smoothly.
Internationale Zusammenarbeit: a) Ist die Zusammenarbeit mit Kollegen in anderen Ländern ein Bestandteil ihrer täglichen Arbeit? b) Wenn ja, funktioniert diese internationale Zusammenarbeit gut?	International cooperation: a) Is cooperation with colleagues in other countries a part of your daily work? b) If yes, does this cooperation work well?

The six questionnaires had 521 subtopics in total and were grouped in the 44 topics listed above. For 76 subtopics, more than one type of wording could be identified. The number of different wordings was 11 maximum; however, two to three wording alternatives for one subtopic cover more than 60% (Table 7).

Due to the qualitative nature of text-analysis, the number and share of comparable questions, which is also shown, allows for only a rough estimate about the possibilities of direct comparability of questions. The number of wordings, which allow intercompany benchmarking, normally does not exceed 3; in roughly two-thirds only one opportunity for subtopic-related comparison exists. Recalling that additionally a use of different scales applies (see also Table 8), the number of cases in which the wording and scale allow for direct comparison tends to be insignificant.

Table 7. Number and shares of differently worded questions related to a subtopic

Number of Wordings	11	8	7	6	5	4	3	2	Sum
Absolute Frequency [N]	2	2	3	6	9	7	14	33	76
Share [%]	2.6	2.6	3.9	7.9	11.8	9.2	18.4	43.4	100
Thereof number of subtopics with direct comparable wordings									
5		1	1						2
4				1					1
3	1	1	2	2	4	1	1		12
2				3	4	3	4	11	25
Share of wordings, basically suited for intercomp. benchmarking	14.3	50.0	52.4	44.4	44.4	32.1	26.2	33.3	36.4

3.3 Scales

Table 8 shows the number of different types of scale which were used in the six questionnaires.

Table 8: Types of scales

	Alternatives						Ordinal Scale	Nominal Scale	Symmetry		Neutral Alternative		"Don't know" Alternative	
	2	3	4	5	6	>6			yes	no	yes	no	yes	no
1				x				x		x		x		x
2		x						x		x		x		x
3	x							x		x		x		x
4	x							x	x			x		x
5	x							x		x		x		x
6		x						x		x		x		x
7			x					x		x		x		x
8				x				x		x		x		x
9					x			x		x		x		x
10						x		x		x		x		x
11					x		x		x			x		x
12					x		x			x	x			x
13				x			x		x		x			x
14				x			x		x		x		x	
15				x			x			x		x		x
16			x				x		x			x	x	
17			x				x			x		x		x
18			x				x		x			x		x
19			x				x			x	x			x
20		x					x			x		x		x
21		x					x			x		x	x	
22		x					x		x		x			x
23	x						x		x			x		x
Sum	4	5	5	5	3	1	13	10	8	15	5	18	3	20

The analysis of the applied scales shows tremendous variability. Even in the limited number of questionnaires we found 23 types of scale, without mentioning these questions which are related to demographic aspects. The number of alternatives shows an almost equal distribution between 2 and 5; 6 alternatives was less frequent and more than 6 alternatives was applied only one time. Roughly 60% of the scales are ordinal scales. From the 13 ordinal scales, 7 are balanced in the sense that the wording is identical except for the word that indicates whether the answer is proven true or false (e.g. totally agree / widely agree / widely disagree / totally disagree). Most parts of the ordinal scale were so-called ‘forced scales’, where no neutral position is offered and where the respondent has to make a choice whether he agrees or not. Only 3 types of scales offered the “don’t know” alternative.

3.4 Comparability and Benchmarking

The results presented above gave hints that the level of comparability could be low when the search for benchmarks for the 2013 ForstBW ESS was started. This expectation proved true. It was possible to identify 12 questions, which could be used for intra-company benchmarking using the results from 2001 and 2013. A sufficient comparability that could be used for comparison with the two other forest institutions was observed in only 9 questions. As we warranted anonymity, these institutions are characterised with ‘Org. 1’ and ‘Org.2’. In both cases the scale differed and a normalisation was carried out as described above (see Section 2.2.4).

The *Figures 1 and 2* depict the results of the inter- and intra-company comparison.

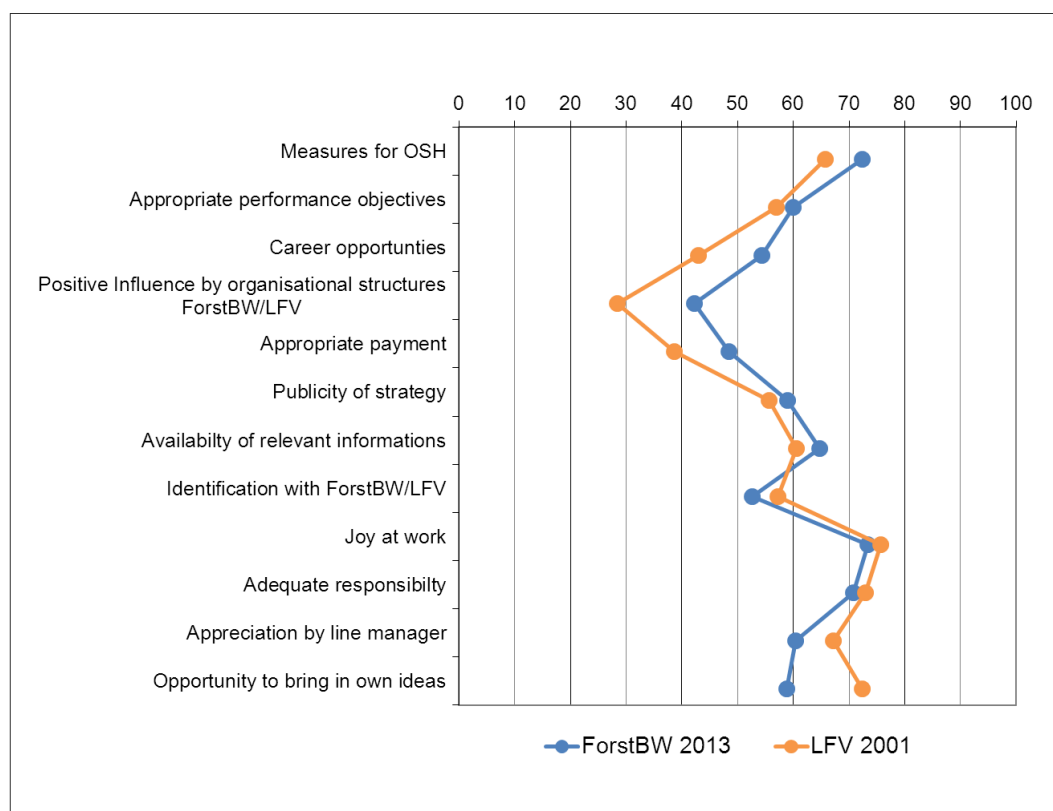


Figure 1. Intercompany benchmarking

It is clear that the patterns of the answers given by the employees of ForstBW in 2001 and 2013 are quite similar. In the year 2001 a five-point Likert scale was used, whereas in 2013 a six-point scale was applied. After the normalisation to a ‘100% scale’, we found

values that are better and some that are worse. This can be seen as a strong indication that there is no bias caused by the normalisation. The absolute difference does not exceed 14%. The averages are very similar (ForstBW 2013 = 60, LFV 2001 = 58), that is, the coefficient of variation is smaller to some extent in 2013 (0.15) if compared with 2001 (0.24).

The intercompany differences are shown in *Figure 2*. The differences of the overall means are insignificant if comparing ForstBW with Org. 1 (1%), but can reach a notable amount in comparisons with Org. 2 (7%). The absolute values show the same characteristic. There are similarities and differences. With 27% maximum, the latter one reaches a higher level compared to the values of the intra company comparison. The coefficients of variations are at an astoundingly equal level (0.12, 0.12, 0.11). Again, it can be concluded that the normalisation allows for similar findings as well as the detection of various levels of satisfaction.

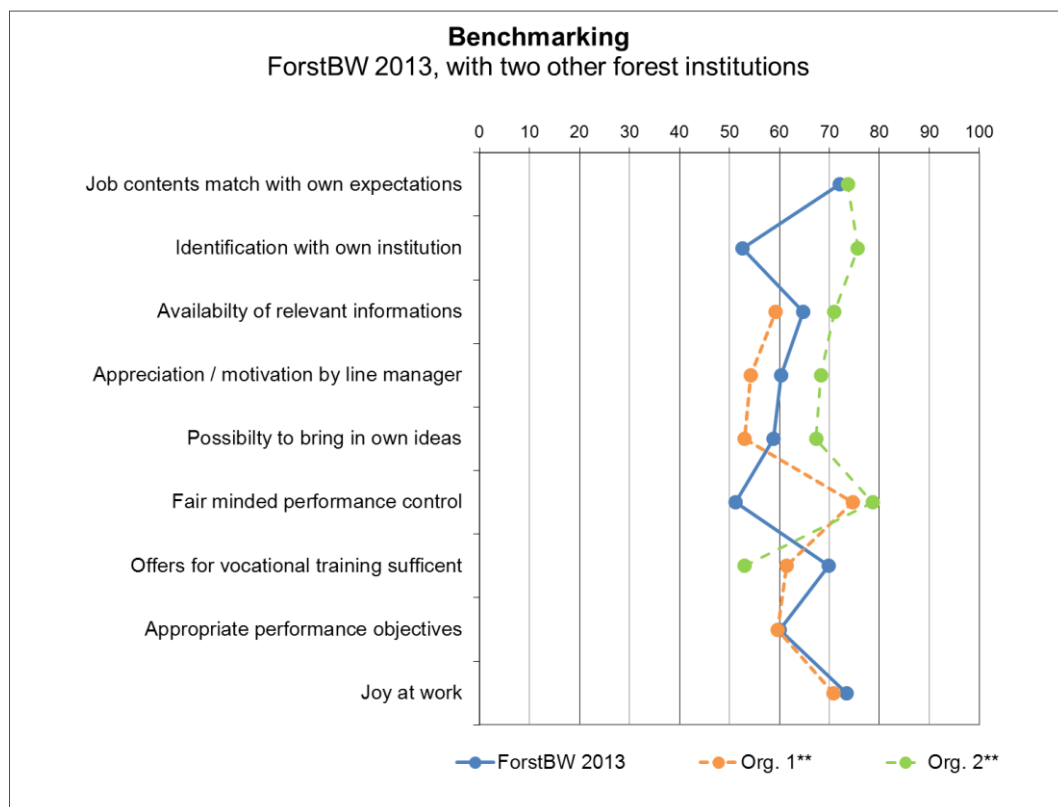


Figure 2. Intercompany comparison

4 DISCUSSION

4.1 Topics

The choice of topics within the individual ESS already shows a wide variability. Even from the 10 most important topics only 6 were addressed with at least one question in all surveys (*Table 4*). An analysis of the topics of middle and lower importance (not depicted in the paper) shows that a case-related choice of the contents prevails. Thus, it can be stated that forest ESS show the same selective or institution-related approach as described for ESS in other sectors. As participation of the employees during process of development of an ESS plays a relevant role in almost all cases, this situation is not surprising. As shown above, the number of questions related to the different topics varied tremendously. Consecutively, the importance of the topics can be very different in all cases where the satisfaction index is

calculated on the basis of the individual questions. The selection of topics and questions included in the indices is related to the total number of questions in the individual ESS, which varies too. Therefore, it has to be stated that the comparison of the overall indices should be avoided due to the fact that the issues addressed and the intensity of the ESS cannot be compared at a satisfactory level.

4.2 Wording

The analysis of the wording in the questionnaires reveals that there is no use of any kind of standards and even no visible desire to use wording from other ESS. It can be assumed that the design of the questionnaires is driven more by the personal experience and opinions of the developers, be it that this has been developed and carried out by the institution itself or from a consultant involved. In the latter case, it is rather probable that the standards of the consultant influence the wording, because this reduces the time and effort needed to develop the questionnaire. A tendency that the consultants prefer their own wordings would be supported as well by the fact that the offer of benchmarking data can be a profitable side business after the ESS. With regard to the forest ESS, it has to be stated that there were almost no identical questions and even the share of comparable questions is low. Together with a finding that the wording does not always meet technical standards, such as addressing only one topic in a single question or using only positive or negative statements in a section of a questionnaire, it has to be concluded that the chance for comparisons on the level of individual questions is limited as well.

4.3 Scales

The results of the scales applied in the six ESS used for a comparison to the ESS of ForstBW carried out in 2013 were almost self-explaining as 23 different scales could be identified in the underlying questionnaires. It has to first be questioned whether the questionnaires were designed professionally. The number of scales and changes of scale should be limited, because there is always the risk that the respondent does not realize this change and gives his answers on the basis of the scale of the previous sections. As there is almost no chance to verify whether the scales have been used properly, the results can be notably biased.

4.4 Comparability and Benchmarking

The possibilities for an in-depth benchmarking are very limited. This applies especially for the benchmarking of the employee satisfaction indices. The selection of topics and number of questions varies widely and even the way in which the indices were calculated can differ. Together with the use of different scales, partially more than one scale is used in a single ESS questionnaire; rendering it impossible to make assumptions about the differences of the overall satisfaction in the different forest institutions. This leads to a situation that benchmarking data are more or less unavailable, or have to be bought from consulting enterprises unless it is not known whether these data are comparable or not. It can be assumed that the price of the benchmarking data notably increases the costs of the whole analysis.

The analysis of the scales offered a detailed insight into the heterogeneity of the individual questionnaires and the alternatives for responses. Recalling that only seven questionnaires are included in the analysis, it became obvious that in most questionnaires a multitude of scales is applied. An in-depth analysis of the questionnaires shows that there is frequently a change of scale from one part of the questionnaire to the next. The scales are changed partially even from question to question. This conflicts with the dominant recommendation in the literature that the change of scale has to be avoided to a maximum extent. However, there are hints that this problem is limited in questionnaires that are used to

develop some kind of employee satisfaction index. Here the developers were more aware that a change of scale can provoke errors during the completion of the questionnaire. Nevertheless, it has to be stated that the degree of professionalism could be notably improved. The wish to evaluate the opinion in respect to very specific topics is not necessarily linked to the need to use different answer-scales.

However, there is one circumstance that helps to carry out comparison of equally worded questions in the case that only the number of categories applied differs. Recalling that the number of questions included in an inter- and intra-company comparison was very limited (9 respectively 12 questions, see above), there are strong hints that a normalisation of the scales could be applied. The ESS in ForstBW (2013) and LFV (2001) was executed in almost the same situation about three years after a harsh reorganisation and with the awareness that the degree of dissatisfaction was high. As more than two-thirds of the people of the study overlapped, the basic hypotheses must be that no larger differences in the overall satisfaction are given, but variations in respect to different items are to be expected. The results achieved above, after the normalisation of a five- and six-point Likert scale, have basically proven these hypotheses.

4.5 Summary

The results reveal that forest ESSs are highly customized at the moment. The possibilities to make a meaningful benchmarking are limited to single questions and even here, some, but no significant, uncertainties remain in cases where different scales had been applied. This situation is mainly driven by the requirement to include the target groups in the development process of the ESS. In addition, it cannot be excluded that the consultants force this too, because any use of standardized questionnaires would reduce the need to involve them. Moreover, the sale of benchmarking results is, at least potentially, a side-business too; this furthermore reduces the interest of consultants to use standard questions or index calculations as well. Thus, it must be stated that the value of the ESS is at present limited to an intra-company time series. However, it has to be kept in mind that organisational changes are permanent concomitants that may hinder or prevent the realisation of meaningful replication of the ESS.

The results reveal that there are topics that are of interest in most forest enterprises and that the present wording and design of the questionnaires does not always reflect the best practice standards. Consecutively, it can be assumed that the choice of professionally-worded questions from a publicly available set of questions could improve the individual ESS without necessarily hampering the requirement to cover the issues that are of special interest in the respective institution.

5 CONCLUSION AND OUTLOOK

At present it can be stated that in the German-speaking region we found customized ESS with very limited possibilities to undertake any kind of benchmarking. Furthermore, a large potential of these surveys, which are always cost-intensive undertakings, is not used. At least two approaches that can lead to a stepwise improvement in possibilities for intercompany comparability can be identified.

A kind of database, in which properly worded questions related to individual topics are available during the design of new ESS, can facilitate and speed-up the process of the development in a way that the time consuming wording of questions is replaced by a choice of questions. In the case that at least the former users of these questions, or even better (anonymized) benchmarking data are available in the database too, a cost-free and reliable

comparison becomes basically achievable. Identical scales are useful; however, the normalization of scales seems to be a feasible approach to bridge that gap.

In the case that there are already existing ESS in an institution, any change of the structure of the questionnaire or even questions and their wording must be discussed carefully, because an intra-company time series of identical repetitive ESS is a value as such. Here, an inclusion of a set of additional index questions related to the most important topics (see *Table 3*), which can be used to derive a sort of intercompany standard for employee satisfaction indices, could offer the chance to compare at least the overall employee satisfaction or the satisfaction in some thematic areas. These index questions could be seen as a subset out of the database discussed above.

Such a subset could be used as well for intermediate “snapshot-ESS” between the more comprehensive and therefore more expensive regular ESS, which are frequently carried out in longer time intervals.

The balance between customizing and benchmarking is not given yet. However, it seems possible to make progress using a more incremental approach without risking the loss of the own data and experiences. Therefore, it is less of a technical problem to come closer to a balance; rather, desire is needed to enhance the transparency by using benchmarking data.

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